VOL. V, NO. 1 OCTOBER, 1922

PROCEEDINGS

OF THE

HAWAIIAN ENTOMOLOGICAL SOCIETY

FOR THE YEAR 1921

HONOLULU, HAWAII
PRICE 75 CENTS

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All correspondence should be addressed to the Secretary, Hawaiian Entomological Society, Honolulu, Hawaii, from whom copies of the Proceedings may be purchased.

Volume I of the Proceedings, for 1905-07 (in five numbers), contains 210 pages, 4 plates, and 5 text figures.

Volume II, 1908-12 (in five numbers), contains 311 pages, 7 plates, 5 cuts and 1 portrait.

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PROCEEDINGS

OF THE

Hawaiian Entomological Society

VOL. V, NO. 1. FOR THE YEAR 1921. OCTOBER, 1922.

JANUARY 6th, 1921.

The 184th meeting of the Hawaiian Entomological Society was held in the entomological laboratory of the experiment station of the Hawaiian Sugar Planters' Association, President Timberlake presiding. Other members present: Messrs. Giffard, Ehrhorn, Muir, Osborn and Whitney, and Dr. L. O. Kunkel, visitor.

In the absence of the Secretary, Mr. Osborn was appointed Secretary pro tem.

The minutes of previous meeting were read and approved with corrections.

The Executive Committee reported the selection of Mr. Muir as Librarian, Mr. Timberlake, Custodian of Collections, and Mr. Swezey, Editor for 1921.

The resignation of the Secretary, Mr. Fullaway, was received, he being absent on foreign insect work. Mr. Willard was elected to fill the vacancy for the balance of the year.

PAPERS READ.

"Observations on Xylocopa and Lithurgus (Hymenoptera)."

BY W. M. GIFFARD.

"Synonomy of the Carpenter Bee, Xylocopa varipuncta (Hymenoptera)."

BY P. H. TIMBERLAKE.

NOTES AND EXHIBITIONS.

Mr. Muir exhibited some specimens of weevils that had been determined by Dr. Marshall of the British Museum, from

specimens sent him by Mr. Swezey, and read Dr. Marshall's letter in regard to them. The species were as follows:

Stenommatus musae, recently described by Dr. Marshall from the specimens sent by Mr. Swezey, collected by him in banana corms at Kaimuki and thought to be an immigrant, but according to Dr. Marshall, not necessarily to be considered as an introduced species.

Stenotrupis sp., a small Cossonid which has been found a few times in sugar cane on Oahu. It is not represented in the British Museum, and is probably undescribed.

Lithurgus albofimbriatus Sich. (*Megachilidae*) and *Xylocopa varipuncta.*—Mr. Giffard exhibited portions of a tree-trunk fence post, collected at Waimea, Oahu, December 27, 1920, showing channels and cocoons constructed by *Lithurgus,* and *Xylocopa;* also a cut section of the same post about 2½ feet long and 8 inches in diameter from which, in 7 days, 19 males and 25 females of *Lithurgus* and 22 males and 27 females of *Xylocopa* issued. Also were exhibited slide mounts of mouth parts and genital organs of both sexes of *Lithurgus.*

Alphitobius piceus.—Mr. Giffard exhibited a number of these Tenebrionid beetles taken from the above sections of fence post.

New Miscogasterid.—Mr. Timberlake exhibited a single specimen of a parasite reared by Mr. Swezey from flower heads of *Dubautia* collected on Mt. Kaala, Oahu, September 26, 1920. A large number of *Tephritis dubautiae* Bryan were reared from these flower heads, but there was only one specimen of the parasite, which is a new species of the Miscogasteridae, and is also a representative of an undescribed genus. As no other insects were reared from the material, the host of the parasite is probably the *Tephritis* that issued so abundantly. So far as known, no other Miscogasterid has been reared in these islands (except the common introduced *Tomocera*), although the family is one of the few groups of the Chalcidoidea represented in the endemic fauna. The species are rather numerous and fall into several genera, but specimens are infrequently met with, and the accumulation of mate-

rial becomes a slow process. Mr. Timberlake also exhibited another specimen strictly congeneric with Mr. Swezey's, which he collected from a *Raillardia* tree on Haleakala, Maui, at an elevation of about 5800 feet, July 22, 1919. The association of this unnamed genus with Compositae is therefore more assured, and this is easily explained if the species are really parasitic in *Tephritis,* as species of the latter breed in the flower heads of both *Dubautia* and *Raillardia.*

Insects on Chinese cabbage.—Mr. Whitney exhibited three species of insects intercepted in quarantine, on Chinese cabbage from San Francisco.

Syrphidae: *Melanostoma stegnum* (Say) and *Syrphus* sp.

Anthomyiidae: *Phorbia fusciceps* (Zett.), commonly known as the seed-corn maggot.

FEBRUARY 3, 1921.

The 185th meeting of the Hawaiian Entomological Society was held at the experiment station of the H. S. P. A., with Mr. Timberlake presiding. Other members present were Messrs. Crawford, Ehrhorn, Giffard, Muir, Osborn, Swezey, Whitney, and Willard. Mr. T. L. Bissell and Dr. L. O. Kunkel were visitors.

The minutes of the previous meeting were approved as read and corrected.

Mr. Swezey gave an interesting report on his attendance of the meetings of the American Association for the Advancement of Science, American Association of Economic Entomologists, and Entomological Society of America, held at Chicago University, December 27 to 31, 1920.

Mr. T. L. Bissell was nominated for active membership in the Society.

NOTES AND EXHIBITIONS.

Mitrastethus bituberculatus (Fabr.).—Mr. Swezey exhibited a specimen of this weevil, identified by Dr. Marshall of the British Museum, who stated that it was a New Zealand species. A letter from Commander J. J. Walker, President of the Entomological Society of London, states that he has found this

insect very commonly in several localities in the North and South islands of New Zealand. Also, that it appears to be practically confined to the native and imported conifers, occurring under the bark and in the decaying wood of old logs, and not in the living tree. It is the weevil from rotten wood, mentioned on pages 374 and 382 of Proceedings Haw. Ent. Soc., III, No. 5, 1918.

Metamasius ritchiei Marshall.—Mr. Ehrhorn exhibited a specimen of this pineapple weevil, which came from Jamaica. He stated that it does extensive damage to the fruits, stems, and the roots of pineapple plants, and that a living larva of this species had been found in some pineapple plants that were imported into Honolulu from Mexico.

Gitonides perspicax Knab.—Mr. Timberlake exhibited four specimens of this Drosophilid, reared from a mealy bug on sugar cane at Halifax, Queensland, by Mr. Muir in March and April, 1920. The species is apparently widely distributed, as Knab records it from Manila, Philippine Islands, and Pusa, India, as well as from Honolulu. Mr. Muir states that it occurs in Java.

Itoplectis immigrans Timb.—Mr. Timberlake called to attention that Dr. Perkins, in a recent letter to the Experiment Station, states that this "is the species which I referred to in the Fauna as commonplace—no doubt without justification, but at the same time the only species of the subfamily I had specially studied were the fine '*Rhyssa*' group and other conspicuous tropical things, and I must have been thinking of these at the time. Of this *Itoplectis,* I took a female with much broken wings in 1901 in Honolulu. This differs from several later caught ones (1904) in having only the small apical segment black and the propodeum reddish, but it is clearly the same species. It is even possible it may have become darker since its introduction."

In another letter, Dr. Perkins mentioned that he had once seen this species in large numbers, and curious enough all his specimens except one were from Oahu.

Mr. Timberlake remarked that the species must have become much rarer in recent years on Oahu, as it has not been

found recently, although much collecting of Hymenoptera has been done by Fullaway, Bridwell, Williams, and others. He also remarked that it is possible that some of the introduced Hymenoptera do become darker after being in the Islands for a period of years, and this is possibly the case also in *Cremastus hymeniae* Viereck., some specimens of which have considerable black on the thorax. But it is rather unsafe to generalize on the subject as the insects may vary to the same extent in their native habitat.

MARCH 3, 1921.

The 186th meeting of the Hawaiian Entomological Society was held at the H. S. P. A. Experiment Station, with President Timberlake presiding. Other members present were Messrs. Bissell, Ehrhorn, Giffard, Muir, Osborn, Swezey, and Willard.

Minutes of the previous meeting were read and approved.

Mr. T. L. Bissell was elected to active membership in the Society.

PAPERS READ.

"Insects Attacking Ferns in the Hawaiian Islands."

BY O. H. SWEZEY.

"Insect Collecting in Zero Weather in Illinois."

BY O. H. SWEZEY.

NOTES AND EXHIBITIONS.

Dermestes vulpinus damaging lead lining of acid-tank.—Mr. Timberlake exhibited specimens and the work of this Dermestid. These were brought in by Mr. C. C. James, manager of the Pacific Guano and Fertilizer Company. The damage was done by the larvae, which bored their way between the wooden work beneath the tank and the lead lining, in preparation of their pupal chambers. In many instances they had gnawed grooves in the lead, and had in a few cases perforated the lining so that the tank had to be relined.

Insects from figs of Ficus retusa at Hongkong, China.—Mr. Timberlake exhibited 22 species of chalcid-flies, all reared from figs of *Ficus retusa* collected by Mr. Fullaway at Hong-

kong in January, 1921. These are divided into several distinct groups: First, a species of Agaonidae, the true caprifier of the figs; second, a group of 6 species, representing 5 genera, which probably are all inquiline and forming galls of their own inside the figs. These do not fall at all well in any of the subfamilies or tribes recognized by Ashmead, but numbers of the group probably were included by him under the Idarninae, although the more correct position apparently would be a new subfamily of the Callimomidae; third, 5 species of Idarninae, representing 3 genera; fourth, 3 species of the genus *Ormyrus;* fifth, 7 species of *Decatoma.*

* *Undetermined Cricket from Honolulu.*—Mr. Timberlake exhibited specimens of a small peculiar cricket found in rubbish in old boxes stored in a shed at Kaimuki. This species has been collected before, by Mr. Terry at Kekaha, Kauai (May, 1906), and about Honolulu, by Messrs. Ehrhorn and Swezey.

** *New Ichneumonid.*—Mr. Swezey exhibited specimens of an Ichneumonid recently collected by him in a weedy lot at Kaimuki, which is apparently a new immigrant here, not previously recorded.

Nesotocus giffardi.—Mr. Swezey reported having seen borings of this beetle in branches of a *Cheirodendron* tree on a ridge above Hauula. This is the farthest record for this weevil, and now makes its range extend throughout the whole Koolau mountains of Oahu.

Ptinus villiger Reit.—Mr. Swezey exhibited a specimen of this beetle of the family Ptinidae, which was taken with three others from a box of butterflies at Rockford, Illinois. It is a museum pest which he had not seen before, and one which museum collections in the Hawaiian Islands are not troubled with.

Kelisia paludum Kirk.—Mr. Muir exhibited a specimen of

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* *Cycloptiloides americanus* (Sauss.), as determined later by Morgan Hebard. [Ed.]

** *Casinaria infesta* (Cress.), as determined later by R. A. Cushman. [Ed.]

this insect from Jamaica, and remarked that this extends the distribution of this Hawaiian species to the Atlantic.

Machilis heteropus.—Mr. Muir exhibited a specimen of *Machilis heteropus,* with drawings showing the likeness between the first maxillae, palpus, mandibles, and antennae.

APRIL 7th, 1921.

The 187th meeting of the Hawaiian Entomological Society was held at the experiment station of the Hawaiian Sugar Planters' Association, with Mr. Timberlake in the chair. Other members present were Messrs. Bissell, Crawford, Ehrhorn, Muir, Osborn, Swezey, and Willard. Visitors present were Messrs. Geo. C. Roeding, a prominent fruit grower from Fresno, California; H. L. Lyon, L. O. Kunkel, and E. L. Caum of the Hawaiian sugar planters experiment station, and Q. C. Chock of the Territorial Board of Agriculture and Forestry.

Minutes of the previous meeting were read and approved.

Mr. Swezey reported that the Hawaiian Sugar Planters' Association had donated an additional $300 to the Society to help defray printing expenses.

Upon motion of Mr. Crawford, it was voted that the secretary, upon receipt of the donation, write a letter to the Trustees of the H. S. P. A., expressing the appreciation and thanks of the Society.

Upon motion of Mr. Muir, it was voted to suspend the regular program to enable Mr. Geo. C. Roeding to talk on fig insects.

Mr. Roeding outlined the life history of the *Blastophaga,* gave an account of its introduction into California, and related interesting experiences and anecdotes connected with his trip to Smyrna, undertaken to investigate the habits of *Blastophaga,* and the methods of caprification employed there by the natives.

JUNE 2d, 1921.

The 188th meeting of the Society was held in the entomological laboratory of the Experiment Station, H. S. P. A., with President Timberlake presiding. Other members present:

Messrs. Ehrhorn, Muir, Fullaway, Bissell, Osborn, Swezey, Crawford, and Wilder.

Minutes of previous meeting were read and approved.

PAPER READ.

"A New Hawaiian Delphacid (Homoptera)."

BY F. MUIR.

NOTES AND EXHIBITIONS.

Ischiogonus sp.—Mr. Muir exhibited specimens of this parasite of the Australian fern weevil (*Syagrius fulvitarsis*), sent by Mr. Pemberton from New South Wales, Australia. Cocoons of the parasite arrived on May 21, and since then 4 females and 30 males have issued. Most of them have been liberated on Mt. Tantalus, where there are Sadleria ferns infested with the weevil.

Mitrastethus bituberculatus and *Dryophthorus distinguendus*.—Mr. Ehrhorn exhibited these two weevils obtained from the wood of propagating boxes. The former is a New Zealand beetle and was found in the sound wood; the latter was in the rotted wood.

Vanessa callirhoea.—Mr. Swezey exhibited a set of wings of this butterfly sent him by Mr. Charles E. Hempel from Funchal, Madiera Islands. They have markings more nearly like *Vanessa tammeamea* than has any other species. Each species is similarly confined to an isolated group of islands, which are separated by many thousand miles.

Platyedra gossypiella.—Mr. Swezey exhibited a specimen of the pink boll-worm moth reared from the seed capsule of *Hibiscus youngianus* collected by Mr. McEldowney, April 1, 1921, on the ridge at Waimalu, Oahu.

Vanessa tammeamea.—Mr. Swezey stated that Mr. Caum reported to him the finding of 6 chrysalids of this butterfly attached to the leaves of the awa (*Piper methysticum*) in Pukoo Valley, Molokai, February 15, 1921. Butterflies issued from 5 of the chrysalids, and a *Chalcis obscurata* from the remaining one. This is the first record of this as a host for this parasite.

Frontina archippivora.—Mr. Swezey reported rearing this

Tachinid fly from a chrysalis of *Lycaena boetica* in Kaimuki, March 19, 1921. It is the first record of this fly from this host. The maggot issued from the butterfly chrysalis March 11, and the adult fly emerged from puparium March 19.

Aloha ipomoeae.—Mr. Swezey reported that Dr. Lyon had handed him specimens of this leafhopper taken at light in his office at the Experiment Station, March 12, 1921.

Hieroxestes omoscopa Meyrick.—Mr. Swezey stated that in a letter from Mr. Meyrick, this name is given for the Tineid moth described as *Opogona apicalis* by Swezey in Bull. 6, Exp. Station, H. S. P. A., p. 17, pl. III, figs. 4, 5, 1909.

Amaranth Jassid.—Mr. Swezey reported taking this immigrant Jassid on amaranth at Lahaina, Maui, May 20, 1921. This is the first record of its capture on any other island but Oahu, where it was first taken by Mr. Ehrhorn in October, 1918, on *Amarantus spinosus* near his office on the waterfront in Honolulu.

Oxacis collaris.—Mr. Swezey reported this beetle as coming abundantly to lights at the waiting station at Pawaa Junction, Honolulu. Sixty-five of them were counted running on the wooden walls near an electric light in a sheltered place, and sixteen were counted similarly near another light.

Eupatorium macrophylla. — Mr. Swezey reported having found some clumps of this foreign weed growing up at the head of one of the valleys at Maunalua at the dry end of the island of Oahu, April 17, 1921. Some of them were in flower. This is the pest that has become so widely spread on the island of Maui, and is overrunning some of the cattle ranches on the upper slopes of Haleakala. It is called "paumakani" by the Hawaiians. This patch of this weed was reported to the Territorial Forester, who has taken measures towards having the patch eradicated.

Simplicia robustalis.—Mr. Swezey reported rearing this moth from caterpillars which were quite abundant feeding on the dead leaves of chayote vine at Kilauea, Kauai, May 4, 1921. The first record of this immigrant moth on that island.

Telenomus.—Mr. Timberlake exhibited two females of a

probably introduced species of *Telenomus,* apparently not hitherto recorded. The specimens were taken on windows, the first May 10, 1916, at Kaimuki, the other by Mr. Ehrhorn in Manoa Valley, March 29, 1921. It is easily distinguished from the rest of the Hawaiian species by its brown color.

Eulophus.—Mr. Timberlake exhibited specimens of an introduced species of this genus, reared by Mr. Swezey from the lantana leaf-miner collected at Makaha, Oahu, March 27, 1921. The species may be recognized by the extremely coarse reticulation of the scutellum, and by the entirely pale legs, in which characters it differs from all other Hawaiian Eulophidae.

Hunterellus hookeri Howard in India.—Mr. Timberlake exhibited a series of females of this Encyrtid collected by Messrs. Fullaway and Ballard from a dog at Coimbatore, South India, on February 20, 1921. Mr. Fullaway observed that the parasites, when disturbed, did not fly or jump away more than a couple of inches, and directly returned to rest on the dog, much in the same manner that the horn-fly returns to its host after being disturbed. This Encyrtid is known to be parasitic in dog ticks of the genus *Rhipicephalus* and has been found previously in Texas, California, Mexico and Portuguese East Africa.

Ox warble.—Mr. Swezey reported observing the ox warble (*Hypoderma lineata*) on imported cattle at Kilauea and Lihue, Kauai, May 4, 1921. As many as half a dozen of the warbles were observed in the back of one cow.

Draeculacephala mollipes.—Mr. Osborn exhibited specimens of this Jassid collected on small plant sugar cane at Ewa Plantation, Oahu, June 1, 1921. Fifteen indivdiuals were noticed on the cane in about two hours' search. No immature stages were observed.

Mr. Ehrhorn exhibited a collection of economic insects from Porto Rico.

Clytus annularis Fab.—Mr. Fullaway exhibited specimens of this Cerambycid beetle, received from Brother Matthias Newell of Hilo, with the information that it has established itself at Hilo, and can be readily obtained in dry bamboo. This beetle was taken in Honolulu as early as 1905. As but a single

example was found on that occasion, in an insectary at the Experiment Station, H. S. P. A., where some sake tubs were stored, it was believed to have come from the Orient in the tubs. Brother Matthias states, however, that he collected the first specimen taken in the islands many years ago, the specimen having been given to Dr. Perkins. The species has a wide distribution in the Orient, being recorded from India, Assam, Burmah, Siam, China, Japan, Malacca, Java, Timor, Molucca, Aru, New Guinea and Port Jackson, Australia. As far as can be ascertained, this is the first published record of its presence in Hawaii.

Micromus vinaceus.—Brother Matthias Newell of Hilo states in a letter to Mr. Fullaway that this introduced Australian lace-wing fly, which was liberated in Hilo in 1920, has become established and is active on plants infested with aphids.

Insects Collected at Waimea, Hawaii.—Mr. Fullaway furnished a list of insects collected or observed at Waimea, Hawaii, in May, 1921, with notes on particular species, as follows:

COLEOPTERA.

Diachus auratus on rose-bushes.
Pantomorus fulleri.
Gonocephalum seriatum.
Monocrepidius exsul.
Coelophora inaequalis.
Cryptolaemus montrouzieri.
Scymnus notescens.
Hister bimaculatus under cowdung. Other Histers not present.
Philonthus scybalarius.
Lispenodes hawaiiensis.
Aphodius lividus.

HEMIPTERA.

Oechalia grisea.
Nysius sp.
Siphanta acuta.

LEPIDOPTERA.

Anosia erippus.
Herse cingulata.
Vanessa atalanta.
Vanessa cardui. on *Cirsium lanceolatum* so-called Scotch thistle.
Eriopygodes euclidias.
Cirphis unipuncta.
Agrotis ypsilon.
Agrotis dislocata.
Agrotis crinigera.
Spodoptera mauritia.
Plusia chalcites.
Lycaena blackburni.
Pontia rapae.
Omiodes accepta.
Hymenia recurvalis.
Amorbia emigratella.

NEUROPTERA.

Anomalochrysa sp.
Chrysopa microphya.

HYMENOPTERA.

Apis mellifica.
Polistes sp.
Sceliphron caementarium.
Crabro sp.
Odynerus sp.
Chalcis obscurata.
Echthromorpha fuscator.
Ichneumon koebelei.

Ichneumon purpuripennis.
Bassus laetatorius.
Angitia hawaiiensis.
Pheidole megacephala.
Trichogramma sp.

DIPTERA.

Psychoda sp.
Eristalis tenax.
Xanthogramma grandicornis.
Allograpta obliqua.
Frontina archippivora.
Chrysomyia dux.
Sarcophaga pallinervis.
Stomorhina pleuralis.
Lyperosia irritans.
Musca domestica.

SIPHONAPTERA.

Sarcopsylla gallinacea.

JULY 7th, 1921.

The 189th meeting of the Society was held in the usual place, President Timberlake presiding. Other members present: Messrs. Bissell, Crawford, Ehrhorn, Fullaway, Grinnell, Muir, Swezey and Wilder, and Dr. Kunhi Kannan of Bangalore, India, visitor.

In the absence of the secretary, Mr. Swezey was appointed secretary pro tem.

Minutes of the previous meeting were read and approved, with a few corrections.

NOTES AND EXHIBITIONS.

Amblyteles purpuripennis.—Mr. Fullaway reported that specimens of this Ichneumon forwarded to the U. S. National Museum for determination, have been identified with *purpuripennis* (Cresson), a California species, by Mr. Cushman. This is one of the species introduced by Mr. Koebele about twenty-five years ago, probably at the same time that *koebelei* was introduced.

Buprestid larva.—Mr. Ehrhorn reported finding Buprestid larvae in bamboo, imported from Japan, at a Japanese store, the bamboo being so much eaten as to be readily crushed.

Pleistodontes froggatti.—Mr. Muir reported the establishment of this fig wasp on the Moreton Bay fig tree at Emma Square. A large number of the insects were liberated on the tree in February, and just recently a crop of figs has matured on the tree for the first time in its history, and when the fallen figs were examined they were found to have the exit holes where the insects had issued.

Nitidulid beetles in pineapples.—Mr. Crawford called atten-

tion to the problem that the pineapple companies have with this beetle in the canneries. Great numbers of the beetles come in with the pineapples from the fields, and have become a nuisance by getting into the open cans of pineapples before they are sealed up. It is reported that the finding of these in cans on being opened in the States has given rise to stories of young cockroaches being found in Hawaiian canned pineapples. The canneries are greatly concerned in preventing the beetles from getting into the cans. Mr. Fullaway reported having advised the companies in regard to methods of preventing the production of these beetles where they have increased so greatly on account of the pineapple refuse from the canneries which has been hauled to the fields for use as fertilizer. Liming of refuse piles has been tried to prevent the breeding of the beetles in this refuse.

Lantana insects.—There was a general discussion of the work of the introduced lantana insects and the effect that they have had on checking the lantana, and comparisons were made of the present conditions of the lantana with its much greater abundance at the time these insects were introduced from Mexico in 1902. The discussion was introduced by Dr. Kunhi Kannan of Bangalore, India, who stated that lantana had become established some time ago in India and that it is now spread throughout the country. He has been on an extended tour of Europe and the United States, having spent a year in study for the Doctor's degree at Leland Stanford University, and now on returning home was desirous of taking with him some of the lantana insects to try establishing them in India. He particularly wished to try the Agromyzid fly whose maggot feeds in the berries.

Sternochaetus mangiferae.—Mr. Swezey exhibited three pupae of the mango weevil taken from a seed of a mango on which thirty-one egg-punctures were counted on the surface of the fruit when it ripened and fell from the tree June 6. He stated that egg-punctures had been observed numerous on many of the mangoes, but on examination of the seeds usually not more than two weevils were found to have developed in each seed. In three instances only had he found as many as

three weevils per seed. He was unable to account for the failure of so large a proportion of the weevil eggs. Mr. Wilder commenting on the prevalence of the mango weevil this season, stated that in his progagation work he had a germination of but 4 per cent of the seeds.

Nesoprosopis anomala.—Specimens of this rare native bee were exhibited by Mr. Swezey, who reported the finding of a nest in a borer hole in the dead trunk of a *Pipturus* tree on Tantalus, June 19, 1921. There were 8 pupae in a series of cells in a single row. From these, 3 females and 5 males appeared a few days later. In the tin box where the pupae had been kept there was a strong odor somewhat resembling citronella. A female and 2 males of the same bee were caught at flowers of *Straussia* very near to where the nest was found.

Nesoprosopis unica.—Mr. Swezey reported finding a nest of this bee in the pith cavity of a dead *Pipturus* twig on Tantalus, June 19, 1921. From this nest one male bee issued, while the other 4 larvae in the nest each had a larva of *Eupelmus* feeding on it. These matured July 5 to 7. They were 1 male and 3 females, coming near to Dr. Perkin's species *euprepes.*

Dictyophorodelphax mirabilis.—Mr. Swezey reported collecting one male specimen of this strange leafhopper on *Euphorbia* at Wahiawa, June 3, 1921. Also two nymphs which were parasitized by a Dryinid. It is the first time that he has found specimens of this leafhopper that were parasitized. This is a new locality record, and extends the known range of the species.

Apomecyna pertigera.—This beetle was exhibited by Mr. Swezey, who reported having reared 66 of them from a length of eight feet of a gourd vine (*Sicana odorifera*) growing on a fence at the Vineyard St. Nursery, May 10, 1921. The vine had made an extensive growth on the fence, and was very badly infested by larvae of this beetle. There must have been thousands of them. The beetle has been known to attack melon and cucumber vines, but not to such an extent as in the present instance. Other insects breeding from the same eight-foot piece of vine as above, while in a decaying condition were:

30 *Achritochaeta pulvinata*, 2 Oscinids, 1 *Araeocerus fasciculatus*, 1 small Anthribid with long antennae (*Lawsonia* sp.), 5 *Opogona aurisquamosa*, 1 *Opogona purpuriella* (it is not certain about this species, but the specimen was found dead on the table near the breeding jar containing the material, and as the cover had been off accidentally several times, it could have come from this. This is the first record of this moth from Oahu, it being previously known only on Hawaii), 5 *Ereunetis minuscula*, 1 *Pyroderces rileyi*, 3 *Cremastus hymeniae*, 1 banded-winged *Apanteles*. The two latter were parasitic on one or more of the Tineids.

Cirrospilus sp.—Mr. Timberlake exhibited specimens of a previously unrecorded parasite evidently belonging to this genus. It was reared by Mr. Swezey from the lantana leafminer collected at Lihue, Kauai, May 6, 1921, and at Spreckelsville, Maui, May 18, 1921. Mr. Swezey believes that he reared the same parasite on Oahu some years ago, but the specimens have been misplaced. It is easily distinguished from all the rest of the Hawaiian Eulophidae by its bright yellow color and greenish black markings, and is unquestionably an introduced species.

Tenebrionidae.—Mr. Timberlake exhibited a specimen of *Ammophorus insularis* Boh. found beneath a wooden box on bare ground at Kaimuki, June 8, 1921, only a few rods from the locality where it was rediscovered about a year previously; also a single specimen of an undetermined Tenebrionid quite distinct from all others in the local collections. This was taken in Honolulu, June 23, 1919, but the details of capture were not remembered.

Megachile fullawayi.—Mr. Timberlake exhibited a female specimen of this bee collected on a *Gaillardia* flower at Kaimuki June 5, 1921.

Megachile timberlakei.—Mr. Timberlake exhibited a nest and specimen of this bee collected by Mr. Ehrhorn in a crevice about his house at Kahala, June 26, 1921. The nest was made out of the leaves and colored bracts of the *Bougainvillea*.

Oecanthus sp.—Mr. Ehrhorn reported having secured from

a Japanese passenger on a steamer, specimens of singing crickets being used as pets.

Dichocrocis punctiferalis Gn.—Mr. Ehrhorn exhibited 7 Pyralid moths of this species, reared from pupae found on five-leaved pine in conservatory of the Japanese steamer "Tenyo Maru" while in port June 8, 1921. This was on the return trip of the steamer from San Francisco. Infestation must have occurred while the steamer was at some Oriental port, the moth having a range all the way from Japan to India and to Australia. The moths issued four days after the pupae were collected on the steamer, and well illustrates how insects infesting plants on steamers could mature while the steamer was in port and come ashore. Probably a number of our introduced pests have arrived here in just this way. Some specimens of a Xylorictid moth (*Ptochoryctis tsugensis* Kear.) were reared from the same material as the above.

AUGUST 4th, 1921.

The 190th meeting of the Hawaiian Entomological Society was held at the usual place, with President Timberlake in the chair. Other members present were Messrs. Bissell, Fullaway, Muir, Osborn, Whitney, Wilder, and Willard. Dr. Kunhi Kannan of Bangalore, India, was a visitor.

Minutes of the previous meeting were read and approved.

PAPERS READ.

"Description of a Cuckoo-Wasp from the Hawaiian Islands (Hymenoptera)."

BY S. A. ROHWER,

Bureau of Entomology, United States Department of Agriculture, Washington, D. C.

"Conditions of Entomological Work in India."

BY DR. K. KUNHI KANNAN,

Government Entomologist, Bangalore, India.

NOTES AND EXHIBITIONS.

Ptinus brunneus Dufts.—Mr. Timberlake exhibited a specimen of this beetle collected in Honolulu November, 1909, by Mr. D. B. Langford. This is an imported species that has never been recorded from the Islands.

Uscana semifumipennis, in Texas and India.—Mr. Timberlake reported on identifying this common Bruchid parasite from Brownsville, Texas, from the eggs of *Mylabris sallaei*, in the material collected by Mr. Bridwell and brought to Honolulu by Mr. Willard. Mr. Fullaway also obtained the same species in India, the specimens having been given to him by Mr. Subramaniam. These were reared from eggs of *Mylabris chinensis* in stored cajanus at Bangalore, July 8, 1920.

Megachile timberlakei.—Mr. Timberlake reported on another nest of this bee collected by Mr. Ehrhorn at Kahala on July 10. The nest was built inside the frame of a door lock, and was made of Bougainvillea leaves and colored bracts, the female using the keyhole as the natural entrance and exit. On about July 31 to August 3, four females and eight males issued from the nest.

Correction of records of Plagithmysine beetles.—Mr. Timberlake called attention to the following lapses in recent numbers of the Proceedings.

In the Proceedings, vol. 3, p. 384, 1918, Mr. Bridwell recorded a *Plagithmysus acuminatus*, taken in Wailupe Valley, Oahu, on *Sapindus*. This name is a clerical error for *P. cuneatus* Sharp. In vol. 4, p. 50, a *Clytarlus vestitus* was recorded from Olinda, Maui, by Fullaway and Giffard. This is another clerical error, and the species in question is *Neoclytarlus modestus* (Sharp).

SEPTEMBER 1st, 1921.

The 191st meeting of the Hawaiian Entomological Society was held at the experiment station of the H. S. P. A., with President Timberlake presiding. Other members present were Messrs. Bissell, Fullaway, Ehrhorn, Giffard, Grinnell, Muir, Whitney, and Willard. Dr. Kunhi Kannan and A. H. Soon were visitors.

The minutes of the last meeting were read and approved as corrected.

Mr. Albert H. Soon was nominated for membership by Mr. Grinnell.

It was brought to the attention of the society that Mr.

Albert Koebele, an honorary member of the society, was having considerable trouble in getting proper recognition from American consuls in Europe in his attempt to return from Europe to the United States. Mr. Fullaway moved that a committee be appointed to formulate resolutions which would draw the attention of those in authority to the great value of Mr. Koebele's services to the United States, especially in Hawaii and on the Pacific Coast; and to ask that special consideration be given him in his request for passports. This motion, after being amended by Mr. Muir to the effect that the committee consist of Mr. Fullaway, Mr. Swezey, and Mr. Giffard, was passed.

NOTES AND EXHIBITIONS.

Mr. Timberlake exhibited a cockroach,* which is apparently new to the Islands. Found by him in his house at Kaimuki.

Mr. Giffard exhibited a small representative collection of Kauai insects, principally Coleoptera, collected in April, 1920, by J. A. Kusche. Among these are species of *Lucanidae, Plagithmysus, Clytarlus, Rhyncogonus,* etc., from the mountain regions back of Waimea and Makaweli.

The following notes on "Insect Observations on the Island of Hawaii," were given by Mr. Ehrhorn.

On July 25, on the Volcano road six miles from Hilo, *Pseudococcus montanus* was found very abundant on Ieie vine. *Pseudococcus straussiae* was found plentiful on *Straussia* and showed some parasitism. *Pseudococcus bromeliae* was found on twigs of *Straussia* covered over with soil by the ant *Pheidole megacephala,* as well as on Hilo grass roots and roots of large sedge. A mantis egg mass was also found in this locality.

August 2, at the Parker ranch, the following observations were made: At Waiki, Olinda bugs, or Fuller's rose beetle, were found very abundant in the orchard, where they seemed to be especially fond of the leaves of plum trees. The woolly-aphis was observed on the apple trees, and was no doubt introduced when the trees were imported. At an altitude of 4750

* *Supella supellectilium* (Serv.), as determined later by Morgan Hebard. [Ed.]

feet, a large ant lion, *Formicaleo wilsoni* McLach. was caught. These were plentiful flying about over pasture lands. At the old Purdy place, *Odonaspis ruthae* Kotinsky, were feeding on the roots of Manienie grass. At the new dairy, altitude 3200 feet, Olinda bugs were attacking and seriously damaging the foliage of a native tree, *Sophora chrysophylla.* It is claimed that many of these trees are killed by this defoliation. At an altitude of 3000 feet, *Heliothrips hemorrhoidalis* was damaging the young leaves of Eucalyptus trees. This species is quite abundant in the forest areas of the various islands, and has probably been here many years.

On August 4, with Mr. Swezey, in cane field at Olaa (above Mountain View), were observed many nymphs of *Cyrtorhinus mundulus,* which was introduced last year by Mr. Muir, and which has spread considerably since liberation.

August 6, Mr. Swezey found Hilo grass at Kapapala ranch badly infested with *Trionymus insularis.* The Tahiti coconut weevil *Diocalandra taitensis* (Guer.), previously reported by Mr. Swezey from the Kona section, was also found. These were in the husk near base of nut. The nuts were from the coast at Punaluu.

On August 9, indications of the work of the Tahiti coconut weevil were found at Puuiki and near the shore at Kalapana. The trees were so high that no weevils were found. The cane borer was found in the heart of a coconut tree, the stump of which had rotted.

It was noted that the Mediterranean fruit fly was not serious at Wainaku, there being good amounts of strawberry guavas, coffee, and other small fruits there.

At the Hilo Hotel a number of the Australian lacewings were captured, and Mr. Swezey collected a number of the new green grasshopper, which is very abundant about the lights on the hotel lanai. No males were observed, although some young were seen on plants in the garden.

OCTOBER 6th, 1921.

The 192d meeting of the Hawaiian Entomological Society was held in the usual place, with President Timberlake in the chair. Other members present were Messrs. Bissell, Bryan,

Ehrhorn, Fullaway, Giffard, Illingworth, Muir, Swezey, Soon, and Willard.

The minutes of the last meeting were read and approved.

Mr. Albert H. Soon was elected to active membership in the society.

The committee appointed to draft a resolution showing the entomological services of Mr. Albert Koebele to this country, submitted the following resolution, together with a memorandum of Mr. Koebele's services.

Upon motion by Mr. Muir, it was unanimously voted to accept the committee's report, and that after the resolution had been signed by the president and secretary, that it be forwarded to Mr. E. K. Taylor of Alameda, California, who is Mr. Koebele's attorney.

Resolution of Appreciation of the Entomological Services of Mr. Albert Koebele.

Whereas, it has come to the notice of the Hawaiian Entomological Society that Mr. Albert Koebele, septuagenarian entomologist, former employe of the U. S. Department of Agriculture, and agent in co-operation with the California State Board of Horticulture, also Superintendent of Entomology for the Board of Agriculture and Forestry under the Republic of Hawaii and later consulting entomologist for the Territory of Hawaii and an honorary member of this society since its organization in 1904, also a naturalized American citizen since 1880, has been and is still detained against his will in Germany, whither he went previous to the outbreak of the War to secure special treatment for tropical fever and a disease of the eyes, and at the same time to collect beneficial insects for the Territory of Hawaii; and

Whereas, It is believed that Mr. Koebele merits special consideration from the Government of the United States of America through its representatives because of the invaluable services he has rendered to the country in saving threatened agricultural industries in California and Hawaii by his energy and skill in entomological field research work and particularly in discovering and introducing the natural enemies of certain insects which were at that time destroying the principal crops

of these countries; and were causing incalculable losses to agriculture; therefore, be it

Resolved, that the following memorandum of the conspicuously important services of Mr. Koebele be placed on record with this testimonial of the society's high appreciation of his merit and belief in the worthiness of his claim on the interest of the Government in his desire to return to the land of his adoption and to his home in the State of California.

MEMORANDUM OF KOEBELE'S SERVICES TO AMERICAN AGRICULTURE.

1888-9. As agent for the U. S. Department of Agriculture and for the State of California. Introduced the Vedalia ladybird from Australia and saved the citrus industry in California, which was threatened by the cottony cushion scale. This single exploit saved the orange growers, it is estimated, twenty million dollars.

1890-93. In the same capacity. Visited Australia, New Zealand and the Fiji Islands twice and secured many beneficial insects, principally ladybird beetles which were introduced into California to prey on scale pests.

1893-1910. Traveled in different countries in the interest of the Republic and later the Territory of Hawaii as Superintendent of the Division of Entomology, Board of Agriculture and Forestry and consulting entomologist, collecting beneficial insects to be introduced into the islands for the purpose of destroying injurious insects, thus relieving agricultural and horticultural industries of the severe losses so occasioned. In these years he visited Ceylon, Australia, Fiji, China, Japan, Mexico and Europe. His great work—discovering and introducing the natural enemies of the sugar cane leaf hopper—in co-operation with Dr. R. C. L. Perkins, earned him lasting fame in the Territory of Hawaii, and saved an industry now worth fifty million dollars yearly.

In 1910 Koebele was relieved from active duty and retained as Consulting Entomologist, on account of ill-health brought on by fever contracted during his exploration and research work in fever-infested regions of the tropics.

The following detailed account of Koebele's work was pub-

lished in 1911 by Dr. L. O. Howard, Chief Entomologist of the United States Department of Agriculture. (Bul. 91, U. S. Bureau of Entomology. July 29, 1911.)

"The Australian Ladybird (Novius Cardinalis Muls.) in United States."

"But all previous experiments of this nature were completely overshadowed by the remarkable success of the importation of *Vedalia* (*Novius*) *cardinalis* Muls., a coccinellid beetle, or ladybird, from Australia into California in 1889. The orange and lemon groves of California had for some years been threatened with extinction by the injurious work of the fluted or cottony cushion scale (*Icerya purchasi* Mask.), a large scale insect which the careful investigations of Professor Riley and his force of entomologists at the United States Department of Agriculture had shown to have been originally imported, by accident, from Australia or from New Zealand, where it had originally been described by the New Zealand coccidologist, the late W. M. Maskell. The Division of Entomology had been for several years engaged in an active campaign against this insect, and had discovered washes which could be applied at a comparatively slight expense and which would destroy the scale insect. It had also in the course of its investigations discovered the applicability of hydrocyanic acid gas under tents as a method of fumigating orchards and destroying the scale. The growers, however, had become so thoroughly disheartened by the ravages of the insect that they were no longer in a frame of mind to use even the cheap insecticide washes, and many of them were destroying their groves. In the meantime, through some correspondence in the search for the original home of the scale insect, Professor Riley had discovered that while the species occurred in parts of Australia it was not injurious in those regions. In New Zealand it also occurred, but was abundant and injurious. He, therefore, argued that the insect was probably introduced from Australia into New Zealand, and that its abundance in the latter country and its relative scarcity in Australia were due to the fact that in its native home it was held in subjection by some parasite or natural enemy, and that in the introduc-

tion into New Zealand the scale insect had been brought in alone. The same thing, he argued, had occurred in the case of the introduction into the United States. He therefore, in his annual report for 1886, recommended that an effort be made to study the natural enemies of the scale in Australia and to introduce them into California; and the same year the leading fruit growers of California in convention assembled petitioned Congress to make appropriations for the Department of Agriculture to undertake this work. In February, 1887, the Department of Agriculture received specimens of an Australian parasite of *Icerya* from the late Frazier S. Crawford, of Adelaide, South Australia. It was a dipterous insect known as *Lestophonus iceryae* Will., and for some time it was considered, both by Professor Riley and his correspondents and agents, that the importation of this particular parasite offered the best chances for good results.

Neither the recommendations of Professor Riley nor of the then commissioner of agriculture, Hon. Norman J. Colman, nor the petitions of the California horticulturists gained the needed congressional appropriations, and, since there appeared at that time annually in the bills appropriating to the entomological service of the Department of Agriculture a clause preventing travel in foreign parts, it became necessary to gain the fund for the expense of the trip to Australia from some other source. A movement was started in California to raise these funds by private subscription, but it was never carried through. In an address given by Professor Riley before the California State Board of Horticulture at Riverside, Cal., in 1887, he repeated his recommendations. During the summer of 1887 he was absent in Europe, and the senior author, who was at that time the first assistant entomologist of the department, by correspondence secured from Mr. Crawford numerous specimens of *Icerya* infested by the *Lestophonus* above mentioned. During the winter of 1887-88 preparations were being made for an exhibit of the United States at the Melbourne Exposition, to be held during 1888, and Professor Riley, after interviewing the Secretary of State, who had charge of the funds appropriated for the Exposition, was enabled to send an assistant, Mr. Albert Koebele, to Australia at the expense of

this fund. This result was hastened, and Mr. Koebele's subsequent labors were aided by the fact that the Commissioner-General of the United States to the Exposition was a California man, Mr. Frank McCoppin, and his recommendation, joined to that of Professor Riley, decided the Secretary of State in favor of the movement. In order to partially compensate the Exposition authorities for this expenditure, another assistant in the Division of Entomology, Professor F. M. Webster was sent out to make a special report to the commission on the agricultural features of the Exposition. Mr. Koebele, who sailed from San Francisco August 25, 1888, was thoroughly familiar with all the phases of the investigation of the cottony cushion scale, and had for some time been stationed in California working for the Department of Agriculture. His salary was continued by the department and his expenses only were paid by the Melbourne Exposition fund. He made several shipments of the *Lestophonus* parasite to the station of the Division of Entomology of the Department of Agriculture at Los Angeles, where, under the charge of Mr. D. W. Coquillett, a tent had been erected over a tree abundantly infested with the scale insect; but it was soon found that the *Lestophonus* was not an effective parasite.

On October 15, Mr. Koebele found the famous ladybird (Vedalia) *Novius cardinalis* in North Adelaide, and at once came to the conclusion that this insect would prove effective if introduced into the United States. His first shipments were small, but others continued from that date until January, 1889, when he sailed for New Zealand and made further investigations. Carrying with him large supplies of *Vedalia cardinalis*, the effective ladybird enemy, he arrived in San Francisco on March 18, and on March 20, they were liberated under the tent at Los Angeles, where previous specimens which had survived the voyage by mail had also been placed.

The ladybird larvae attacked the first scale insect they met upon being liberated from the packing cages. Twenty-eight specimens had been received on November 30 by Mr. Coquillett, 44 on December 29, 57 on January 24, and on April 12 the sending out of colonies was begun, so rapid had been the breeding of the specimens received alive from Australia. By

June 12 nearly 11,000 specimens had been sent out to 208 different orchardists, and in nearly every case the colonizing of the insect proved successful. In the original orchard practically all of the scale insects were killed before August, 1889, and, in his annual report for that year, submitted December 31, Professor Riley reported that the cottony cushion scale was practically no longer a factor to be considered in the cultivation of oranges and lemons in California. The following season this statement was fully justified, and since that time the cottony cushion scale, or white scale, or fluted scale, as it is called, has no longer been a factor in California horticulture. Rarely it begins to increase in numbers at some given point, but the Australian ladybirds are always kept breeding at the headquarters of the State Board of Horticulture at Sacramento, and such outbreaks are speedily reduced. In fact, it has been difficult for the State horticultural authorities to keep a sufficient supply of scale insect food alive for the continued breeding of the ladybirds."

* * * *

Other Introductions by Koebele Into California

"Mr. Koebele took a second trip to Australia, New Zealand, and the Fiji Islands while still an agent of the Department of Agriculture, but at the expense of the California State Board of Horticulture, and in 1893 he resigned from the United States Department of Agriculture and was employed by the State Board of Horticulture of California for still another trip to Australia and other Pacific Islands. He sent home a large number of beneficial insects, nearly all of them, however, coccinellids. Several of these species were established in California, and are still living in different parts of the State. The overwhelming success of the importation of *Novius cardinalis* was not repeated, but one of the insects brought over at that time, namely, the ladybird beetle *Rhizobius ventralis* Er., an enemy of the so-called black scale (*Saissetia oleae* Bern.), was colonized in various parts of California, and in districts where the climatic conditions proved favorable its work was very satisfactory, notably in the olive plantations of Mr. Elwood Cooper, near Santa Barbara. Hundreds of

thousands of the beetles were distributed in California and in some localities kept the black scale in check. Away from the moist coast regions, however, they proved to be less effective."

* * * *

"A similar lepidopterous insect, *Thalpochares cocciphaga* Meyrick, was brought over from Australia in the summer of 1892 by Koebele and left by him at Haywards, Calif., but the species evidently died out."

THE HAWAIIAN WORK.

"In 1893 Koebele resigned from the service of the State of California and entered the employment of the then newly established Hawaiian Republic, for the purpose of traveling in different countries and collecting beneficial insects to be introduced into Hawaii for the purpose of destroying injurious insects. Before leaving California he had introduced a very capable ladybird, *Cryptolaemus montrouzieri* Muls., which feeds upon mealy bugs of the genus *Pseudococcus*. This insect flourished, especially in Southern California, and on arrival in Hawaii he found that coffee plants and certain other trees were on the point of being totally destroyed by the allied scale insect known as *Pulvinaria psidii* Mask. He at once introduced this same *Cryptolaemus*, which is an Australian insect, with the result that the *Pulvinaria* was speedily reduced to a condition of harmlessness.

It may be incidentally stated that within the past year efforts have been made by the Bureau of Entomology to send the *Cryptolaemus* to Malaga, Spain, for the purpose of feeding upon a *Dactylopius*. The first attempt was unsuccessful, and the results of the last attempt have not yet been learned.

Another importation of Koebele's into Hawaii was the ladybird *Coelophora inaequalis* from Ceylon, Australia, and China, which was successful in destroying plant lice upon sugar cane and other crops. Writing in 1896, Mr. R. C. L. Perkins stated that Koebele had already introduced eight other species which had become naturalized and were reported as doing good work against certain scale insects. Among other things he introduced *Chalcis obscurata* Walk. from China and Japan, which multiplied enormously at the expense of an injurious lepidop-

terous larva (*Omiodes blackburni* Butl.), which had severely attacked banana and palm trees.

Koebele's travels from 1894 to 1896 were through Australia, China, Ceylon, and Japan. In 1899 he left for Australia and the Fiji Islands, and sent many ladybirds and parasites to Hawaii, especially to attack the scale *Ceroplastes rubens* Mask. The Hawaiian Sugar Planters' Association, an organization which was responsible for Koebele's appointment, subsequently employed Mr. R. C. L. Perkins, Mr. G. W. Kirkaldy, Mr. F. W. Terry, Mr. O. H. Swezey, and Mr. F. Muir. By the close of 1902, sugar planters were especially anxious concerning the damage of an injurious leafhopper on the sugar cane, *Perkinsiella saccharicida* Kirk. This insect had been accidentally introduced from Australia about 1897, had increased rapidly, and by 1902 had become a serious pest. Koebele had made an effort to introduce parasites of leafhoppers from the United States into Hawaii, with unsatisfactory results and consequently in the spring of 1904 Koebele and Perkins visited Australia and collected all possible parasites of different leafhoppers. Altogether they succeeded in finding more than one hundred species. Of these the following hymenopterous parasites are said to have become acclimated in Hawaii: *Anagrus* (two species), *Paranagrus optabilis* Perk. and *P. perforator* Perk. and *Ootetrastichus beatus* Perk. These species are all parasitic upon the eggs of the leafhopper. By the end of 1906 observation upon a certain plantation indicated the destruction of 86.3 per cent of the eggs by these parasites. In addition to these egg parasites certain Dryimid parasites of hatched leafhoppers have apparently become established, namely, *Haplogonatopus vitiensis* Perk. *Pseudogonatopus* (two species), and *Echthrodelphax fairchildii* Perk. Three predatory beetles, namely, *Verania frenata* Erichs., *V. lineola* Fab., and *Callineda testudinaria* Muls., were also distributed in large numbers.

The practical results of these importations seem to have been excellent. There seems to be no doubt that the parasites have been the controlling factor in the reduction of the leafhoppers.

The good work in Hawaii is still continuing. Koebele is now on a visit to Europe to import the possible parasites of

the horn fly (*Haematobia serrata* Rob.-Desv.), Muir is trying to find an enemy to a sugar-cane borer (*Rhabdocnemis obscurus* Boisd.), and other similar work is under way."

PAPERS READ.

"Notes on Immigrant Coleoptera."

BY D. T. FULLAWAY.

"Notes and Observations on Parandra puncticeps Sharp. (Coleoptera)."

BY W. M. GIFFARD.

Mr. Swezey read a paper entitled, "Notes on the Isopod Known as *Geoligia perkinsi,* Dollfus." By Chas. Chilton, Professor of Zoology, Canterbury College, New Zealand.

NOTES AND EXHIBITIONS.

Supella supellectilium.—This cockroach, exhibited by Mr. Timberlake, was first captured by him about April or May, 1921, and sent to Mr. Morgan Hebard of Philadelphia for determination. Mr. Hebard states that it is a cosmopolitan species previously unknown in Hawaii.

Parandra puncticeps Sharp.—Mr. Giffard exhibited thirty-eight adult specimens, and a number of preserved larvae and pupae of this beetle, which were collected at twenty-nine miles, Olaa, Hawaii, at an elevation of 3800 feet.

Dirhinus giffardii.—Mr. Fullaway exhibited a specimen of this parasite collected on a manure pile at Waialae in September, 1921. He stated that this parasite, introduced as a parasite of the Mediterranean Fruit Fly, is undoubtedly established here, and is probably a general parasite of Diptera.

Dermestid larva.—Mr. Fullaway exhibited a living Dermestid larva feeding on a pinned insect specimen. Mr. Giffard stated that he had noticed holes made by these larvae through the sides of cardboard insect boxes, in which the supply of naphthalene had become low, but that a good supply of napthalene was sufficient to prevent their entry.

Caccodes debilis.—Mr. Swezey reported having collected a specimen of this Malacodermid beetle from *Euphorbia* in Iao Valley, Maui, July 8, 1920. This is the first record of this

insect anywhere except on Oahu. It was collected in houses by Blackburn. Perkins collected it outside as well. Mr. Swezey has collected two specimens at the experiment station of the H. S. P. A. (one on a vine), and one at Kaimuki, all of which were collected in 1911.

Oxydema fusiforme Woll.—Mr. Swezey called attention to Dr. Marshall's paper on Samoan Curculionids in the last issue of Proc. Haw. Ent. Soc., vol. IV, where, on page 596, the weevil described as *Pseudolus hospes* by Perkins in the Fauna Hawaiiensis, is determined as *Oxydema fusiforme* Woll., originally described from Ceylon, but known also from Seychelles, Rodriguez and Marquesas, and now from Upolu Island, Samoa.

Micromus vinaceus.—Mr. Swezey exhibited a specimen of this Australian Hemerobiid, collected by him in Manoa Valley at the cane plots of the experiment station, H. S. P. A., at the back part of the valley, August 9, 1921. This is the first specimen to be recovered on the island of Oahu since their liberation in large numbers in 1919 and 1920. He reported also, finding all stages of this Hemerobiid on aphis-infested okra in the garden of the Hilo Hotel, Hilo, Hawaii, July 25, 1921. Brother Matthias Newell had previously observed this insect established in Hilo.

Platyedra gossypiella.—Mr. Swezey reported breeding three specimens of this moth from the flower buds of *Hibiscus youngianus,* found growing along the Volcano Road about six miles south of Hilo, Hawaii, July 25, 1921. Quite a large proportion of the buds on the plants were attacked by the larvae. A female *Pristomerus hawaiiensis* was bred from one larva of the lot. He reported also finding this same plant with flower buds attacked by larvae of *P. gossypiella* in Waimea Canyon, Kauai, September 4, 1921. It thus seems that this plant is one of the common hosts of the pink boll-worm.

Parandra puncticeps.—Mr. Swezey exhibited a chip from a standing dead koa tree at Halemanu, Kauai, showing the egg in situ of this Prionid beetle. The tree from which this was taken was a large dead trunk from which the bark had loosened, but not yet fallen away. Fourteen beetles were found beneath the bark of this and other similar trees nearby. The

females had been ovipositing directly into the solid wood, making an excavation, about 4 mm. deep and slanting downward, into which the egg was placed. The egg is white, cylindrical with rounded ends, 3 mm. long and 1 mm. in diameter. The opening of the egg cavity is blocked by the torn-apart fibers of wood. Many of these were to be seen on the surface of the tree trunks, after it had been discovered how to recognize them. These were placed at an elevation of from near the ground to six feet high. It was not learned whether oviposition took place at a higher elevation up the trunk than one could see conveniently; but it is likely that it did.

Casinaria infesta.—Mr. Swezey reported rearing this Ichneumonid from a larva of *Phlyctaenia ommatias* collected in the Alakai Swamp, Kauai, 4000 feet, August 22, 1921; and from a larva of *Phlyctaenia argoscelis* collected at Kokee, Kauai, 3500 feet, August 18, 1921. This immigrant Ichneumonid was first noticed at Kaimuki in February and March of this year when it was abundant in a weed lot, where many caterpillars were abundant, especially *Hymenia recurvalis,* but the host was not determined at that time.

Dolichurus stantoni.—Mr. Swezey reported collecting a few specimens of this Philippine roach parasite in the forest at Kokee, Kauai, August, 1921. They were abundant, being noticed along all trails of the vicinity.

Amaranth Jassid.—Mr. Swezey reported collecting this little Jassid on amaranth weeds growing at Nawiliwili, Lihue, and Waimea, Kauai, September 9, 7, and 3, respectively. It is the first record of this immigrant Jassid on Kauai, and it is quite abundant in the places mentioned.

Microbracon pembertoni.—Mr. Swezey reported rearing this Braconid from lantana berries, collected at Nawiliwili, Kauai, September 9, 1921. Its host is probably *Crocidosema lantana* or *Platyptilia pussilidactyla,* as the larvae of both these moths were present in the material collected. This is the first record of this Braconid from Kauai.

Leucostoma atra.—Mr. Swezey reported a recent determination of this little Tachinid fly by Dr. Aldrich, from specimens sent a short time ago. It is a common American insect, and

is the fly parasitic on *Corizus hyalinus*, as mentioned in Proc. Haw. Ent. Soc., IV, p. 467, 1921. Dr. Aldrich, in his letter, stated that there were no published records as to the host of this fly, but that there was a manuscript note of its having been reared from *Reduviolus ferus*. Mr. Swezey further reported catching two specimens of it at Kokee, Kauai, 3500 feet, in August, 1921, which is the first record of its occurrence on that island.

Labidura icterica Serv.—Mr. Swezey reported the capture of a specimen of this earwig at Grove Farm, Kauai, September 9, 1921. This immigrant earwig was first recorded in the Fauna Hawaiiensis (II, Pt. VI, p. 690, 1910) by Perkins, as occurring at Honolulu and in the country. The present instance is apparently the first record of its occurrence on Kauai.*

Mylabris sallaei.—Mr. Swezey reported finding this weevil very abundant in pods of *Acacia farnesiana* and algaroba at Mana and Waimea, Kauai, August 17, and September 3, 1921. As many as a dozen exit holes were frequently to be found in one pod of *A. farnesiana*. This is the first record of this insect on Kauai.

Mylabris pruininus.—Mr. Swezey reported collecting this weevil in the garden at the Hilo Hotel, July 25, 1921; and at Kokee, Kauai, 3500 feet, August, 1921; and in Waimea Canyon, Kauai, September 4, 1921. These are the first records of this insect on each of these islands.

Diocalandra taitensis.—Mr. Swezey reported finding this coconut weevil in coconuts from Mr. Monsarrat's beach place at Punaluu, Hawaii, August 5, 1921. The adult beetles were found beneath the bracts at the base of mature coconuts, and larvae were found feeding within the shuck. Dried gum on the surface of the shuck indicated where there were larvae inside. The nuts themselves were not injured. This indicates the probability of this pest having been brought to Hawaii in coconuts from the South Seas at some time.

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* This insect has recently been recorded from Kauai as *L. riparia* (Pallas) by Morgan Hebard. Bishop Museum, Occasional Papers, vol. vii, No. 14, p. 314, 1922. [Ed.]

NOVEMBER 3d, 1921.

The 193d meeting of the Hawaiian Entomological Society was held at the experiment station of the H. S. P. A., President Timberlake presiding. Other members attending were Messrs. Bissell, Bryan, Crawford, Ehrhorn, Fullaway, Giffard, Illingworth, Muir, Soon, Swezey, Whitney and Willard.

The minutes of the last meeting were approved as read.

A communication from Mr. E. K. Taylor of Alameda, Cal., was read, in which he stated that favorable action had been taken by the State Department at Washington in the matter of issuing passports which would enable Mr. Albert Koebele to return immediately to the United States.

PAPER READ.

"An Interesting New Derbid Genus (Homoptera)."

BY F. MUIR.

NOTES AND EXHIBITIONS.

Stigmaeus floridanus.—Mr. Ehrhorn exhibited a pineapple sucker showing this mite, commonly called the Florida pineapple mite, and stated that a fortnight ago a severe outbreak of it was reported in the Moanalua section of Oahu. It was thought at that time to be new to the islands, but after investigation, it was found that in 1908 Mr. Van Dine reported it on pineapple plants in the grounds of the U. S. Experiment Station, and that the record had been either forgotten or overlooked.

Mr. Ehrhorn exhibited also three earwigs found feeding on woolly aphis at Waiki, Parker Ranch, Hawaii. He stated that woolly aphis, feeding on apple trees there, had been destroyed by some enemy, and took some of the twigs with the aphis in a tin can to his office. Upon opening the can, he found the aphis had been destroyed and found the three earwigs on the galls of the apple twig. The earwigs were presented to the Hawaiian Entomological Society.

Zorapteron on Kauai.—Mr. Swezey exhibited a slide mount of a minute insect, which he had collected in a rotten log at Kokee, Kauai, August 20, 1921. Mr. Muir had cleared and mounted it, and endeavored to determine it. It appeared to

be a peculiar form of Orthoptera.* As Mr. Morgan Hebard has recently been revising the Hawaiian Orthoptera, the remainder of the specimens of this insect collected at the same time, have been sent to him for study.

Tenodera sinensis.—Mr. Swezey reported that Mr. Meinecke, of the Territorial Normal School, had reported to him of the occurrence of this preying mantis at Hilea, Kau, Hawaii, in 1920. This is believed to be the first record of its occurrence in that section of Hawaii.

Arrhenophagus chionaspidis Aurivillius. — Mr. Timberlake exhibited specimens of this parasite reared from the males of *Phenacaspis eugeniae,* collected at Kohala, Oahu, October 23, 1921, by Mr. Ehrhorn. This species, although it has never been collected here before, has been in the islands probably for many years, as Mr. Ehrhorn has observed exit holes of a parasite in the male scales of *Phenacaspis* at various times since arriving in Honolulu in 1909.

Euscepes batatae.—Mr. Swezey stated that some pieces of dead Japanese morning glory vine, containing larvae, which were brought in by Mr. Ehrhorn, produced ten adults of the sweet potato weevil and three adults of *Oxydema fusiforme.*

Pseudococcus swezeyi Ehrhorn.—Mr. Whitney reported that this scale insect had been found on *Dianella odorata* by O. H. Swezey at Kokee, Kauai, August 19, 1921; and on the Ilima plant by Mr. Ehrhorn at Waikapu Gulch, Wailuku, Maui, October 12, 1921. These are the first records of this species from these two islands. He stated that it was first described by Ehrhorn from specimens collected between folded leaves of *Acacia koa* from Mt. Tantalus, Oahu, by Swezey, December 5, 1915.

Pseudococcus maritimus Ehrhorn, on various garden crops.

Pseudococcus comstocki Kuwana, on apple and pear.

Mr. Whitney reported that specimens of these scales had been sent from Nelson, New Zealand, by Mr. R. J. Tillyard, and that this is the first record of their occurrence there. He

* This insect proved to be a representative of the Order Zoraptera, and this is the first record of any such occurring here. [Ed.]

stated also that the determinations had been verified by Ferris.

Rhipicephalus sanguineus.—Mr. Fullaway reported that this dog tick had been very abundant about Honolulu during the past summer, and that there were apparently two species. Specimens were sent to Mr. G. W. F. Nuttall, who determined them to be all one species. Mr. Fullaway stated that this is the first time the dog ticks from Hawaii have been definitely determined by an authority.

Formicaleo wilsoni McLachl.—Mr. Bryan exhibited six specimens of this ant lion collected by W. H. Meinecke at Puukamaoa, Kau, Hawaii, September 2, 1921, 1950 feet elevation. He stated that they were comparatively common but hard to catch. They were previously collected by Swezey in 1919 near Kawaihae, Hawaii (Proc. Haw. Ent. Soc., v. IV, p. 338); Giffard, five specimens at Kau, Hawaii, December, 1911 (v. II, p. 228); and by Ehrhorn, Perkins and others in Kau. Also seen by Swezey just below Pahala Mill, Kau, 1905 (v. II, p. 228).

Xystrocera globosa Oliver.—Mr. Bryan exhibited a female specimen of this borer, caught by Robert Plunkett in the Kamehameha School grounds November 3, 1921. A discussion of its habit of attacking only injured or dying parts of the monkey pod tree followed.

North American Syrphidae.—Mr. Bryan read a list of a representative collection of North American *Syrphidae* which has been received by the Bishop Museum from W. M. Davidson of Vienna, Virginia. They were collected both in the East, and southern and central California.

Prosbole hirsuta, a fossil Homopteron.—Mr. Muir showed Handlirsch's figure of the upper Permain fossil *Prosbole hirsuta* and specimens of *Homoptera* of the family *Tropiduchidae,* pointing out the similarity both in the venation and in the heteropterus condition of the tegmen of many species belonging to the family *Tropiduchidae.* In *Prosbole* the anal furrow is behind the cubitus, as it is in *Homoptera,* whereas in *Hemiptera* Comstock and Needham consider that it is before the cubitus; there is no sign of the median furrow which is present in so many *Heteroptera.* These points are all in favor of its being a

Homopteron. On the same plate of Handlirsch's work is the restoration of *Eugereon,* which Mr. Muir called attention to, and stated that if the restoration be correct, the mouth parts are on a totally different system to *Hemiptera* and it can have nothing to do with that order, a conclusion also drawn from the wing venation.

NOVEMBER 16th, 1921.

A special meeting was held at the Bishop Museum for the purpose of viewing a large and very interesting collection of Australian insects, which were collected and exhibited by Mr. J. F. Illingworth. Of special interest was the large number of specimens representing many different species of insects attacking sugar cane. Many species were represented by large numbers of specimens, and Mr. Illingworth very kindly offered to supply members of the society with any of these in which they were interested.

The meeting was well attended by both members and visitors, the following being present members: Messrs. Bissell, Bryan, Carter, Crawford, Ehrhorn, Fullaway, Giffard, Holmes, Illingworth, Muir, Swezey, Soon, Timberlake, and Willard. Visitors: Professor Herbert E. Gregory, Director of the Bishop Museum, Dr. Stanley C. Ball, of the museum staff, Mr. A. F. Judd, a trustee of the museum, and Mr. Q. C. Chock, of the Board of Agriculture and Forestry.

DECEMBER 1st, 1921.

The 194th meeting of the Hawaiian Entomological Society was held at 2:30 p. m. in the usual place. Members present, besides President Timberlake, who presided, were Messrs. Bissell, Bryan, Ehrhorn, Fullaway, Giffard, Illingworth, Muir, Rosa, Soon, Swezey, Whitney, Wilder, and Willard. Mr. E. W. Rust from California, who was returning from South Africa, where he has been collecting parasites of scale insects, was a visitor.

Minutes of the previous regular meeting were read and approved, as well as those of the special meeting held November 16.

Report of the treasurer showed a balance on hand December 1, 1921, of $252.05.

Officers were elected as follows for the year 1922:

President	H. T. Osborn
Vice-President	D. T. Fullaway
Secretary-Treasurer	H. F. Willard
Additional Members of Executive Committee	W. M. Giffard D. L. Crawford

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ANNUAL PRESIDENTIAL ADDRESS.

"Observations on the Phenomena of Heredity in the Ladybeetle, Coelophora inaequalis Fabricius."

BY P. H. TIMBERLAKE.

PAPERS READ.

"New and Little Known Hawaiian Delphacidae (Homoptera)."

BY F. MUIR.

"Tables of Distribution and Food-Plants of Hawaiian Delphacidae (Homoptera)."

BY WALTER M. GIFFARD.

"A Study of the Lucanid Coleoptera of the Hawaiian Islands."

BY EDWIN C. VAN DYKE,
University of California.

"A New species of Rhyncogonus from the Hawaiian Islands (Coleoptera-Rhynchophora)."

BY E. C. VAN DYKE.

"Descriptions of New Genera and Species of Hawaiian Encyrtidae (Hymenoptera), III."

BY P. H. TIMBERLAKE.

"Descriptive and Biological Notes on Blepyrus insularis Cameron (Hymenoptera)."

BY P. H. TIMBERLAKE.

NOTES AND EXHIBITIONS.

Anthomyia vicariens Schiner.—Mr. Whitney exhibited specimens of this fly collected October 2, 1921, by Mr. Ehrhorn in his chicken yard in Manoa Valley. They were referred to Dr. Aldrich of the U. S. National Museum, who states that they belong to this Australian species.

Goniodes stylifer.—Mr. Swezey exhibited one specimen of this turkey louse, collected from a turkey by Dr. H. L. Lyon. The only previous record was by Van Dine, collected on Molokai in 1908.

Lariophagus texanus Crawford. — Mr. Willard exhibited specimens of this Pteromalid, which were reared from *Mylabris sallaei* in pods of *Acacia farnesiana,* collected at Ninth avenue, Kaimuki, and near the Wailupe wireless station at Waialae. He stated that this parasite, which was introduced into Hawaii from Brownsville, Texas, by the Federal Bureau of Entomology, was liberated in these two localities on the 6th and 19th of October, 1921. From pods collected at these two places in the latter part of November, 1921, eight males and forty-eight females were reared, showing that it had established itself in a very short time.

Immigrant Records for 1921.

BY THE EDITOR.

In this list of immigrant insects, those marked with an asterisk were first observed in 1921. The others have been known to be present for from a few to several years, but either unrecorded or their identity not known. Determinations of these are now recorded for the first time. For details of records, etc., refer to the pages given.

	Page
**Stenommatus musae* Marshall (Col.)	2
Stenotrupis sp. (Col.)	2
Mitrastethus bituberculatus (Fabr.) (Col.)	3
Cycloptiloides americanus (Sauss.) (Orth.)	6
**Casinaria infesta* (Cress.) (Hymen.)	6
**Telenomus* sp. (Hymen.)	9
**Eulophus* sp. (Hymen.)	10
Clytus annularis Fab. (Col.)	10
Amblyteles purpuripennis (Cress.) (Hymen.)	12
**Cirrospilus* sp. (Hymen.)	15

Page

Ptinus brunneus Dufts (Col.) 16
**Supella supellectilium* (Serv.) (Col.) 28
Leucostoma atra Towns. (Diptera) 30
Arrhenophagus chionaspidis Aur. (Hymen.) 33
Anthomyia vicariens Schiner (Diptera) 37
? *Lawsonia* sp. (Col.) 75
Sybra alternans Weid. (Col.) 76
Ananca ? *sinensis* Gemm. (Col.) 76
Anthicus floralis L. (Col.) 76
Xylophilus sp. (Col.) 76
Platydema subfascia Walker (Col.) 77
Blapstinus ? *dilatatus* Lec. (Col.) 77
Conibius sp. near *brunnipes* Champ. (Col.) 77
Telopes undulata Motsch. (Col.) 77
Trixagus sp. (*Throscus* sp). (Col.) 78
Osorius rufipes Motsch. (Col.) 78
Lithocharis ochracea Er. (Col.) 78
Hydrovatus confertus Sharp (Col.) 78
Bembidium sp. (Col.) 79
Perigona nigriceps Dej. (Col.) 79
Cercyon sp. (Col.) 79
Lophacateres pusillus Klug. (Col.) 79
Thaneroclerus buqueti Lef. (Col.) 79
Imaliodes pusillus Karsch (Col.) 80
Gnathocerus maxillosus Fabr. (Col.) 80
Anthrenus thoracicus Melsh. (Col.) 80
Stethorus vagans Blackburn (Col.) 80
Pullus sp. (Col.) 81
Coninomus constrictus Gyll. (Col.) 81
Silvanus planatus Germ. (Col.) 81
Silvanus bidentatus (Fabr.) (Col.) 81
Aleochara puberula Klug. (Col.) 81
Gibbium psylloides (Czemp.) (Col.) 81

PAPERS PRESENTED DURING 1921.

A Study of the Lucanid Coleoptera of the Hawaiian Islands.

BY EDWIN C. VAN DYKE,
University of California, Berkeley, Cal.

(Presented by title by W. M. Giffard at the meeting of December 1, 1921.)

In the year 1871, the first specimens of Hawaiian Lucanidae were secured by Mr. Harper Pease, from the "Mountains of Kanoi," and sent to the British Museum, where they were studied by Charles O. Waterhouse[1] and a new genus, *Apterocyclus,* with one species, *honoluluensis,* established for their reception. By the time the "Fauna Hawaiiensis" was published, a few more specimens had been secured, chiefly by Mr. Perkins. These were studied by Dr. David Sharp[2] and, as several were found to differ considerably in structure from the species described and figured by Waterhouse, were described as new. This brought the number of known forms from the islands up to seven, where it has remained ever since. Within the last few years, however, a fairly large number of specimens has been collected, especially through the field work of Mr. J. August Kusche, who captured, in 1919, considerably over a hundred specimens in the uplands of the island of Kauai and of Mr. H. T. Osborn, who found about a dozen, at Puu Ka Pele, Kauai, the same year. A portion of the specimens collected by Mr. Kusche came to me through the courtesy of Mr. Preston Clark, of Boston. The remainder were secured by Mr. W. M. Giffard and the Bishop Museum, both of Honolulu. Mr. Osborn's specimens went to the collection of the Hawaiian Sugar Planters' Association.

As a result of an examination of my specimens, I soon found that our ideas with regard to the group needed revision. Mr. Giffard, who had been studying the specimens in the islands, came to the same conclusion and later on, finding that I had been devoting some time to their study, wrote to me and

Proc. Haw. Ent. Soc., V, No. 1, October, 1922.

[1] Trans. Entom. Soc. London, 1871, p. 315.

[2] Fauna Hawaiiensis, Vol. III, Pt. V, Coleoptera, pp. 403-405.

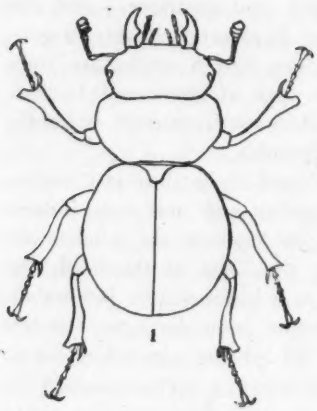
requested that I complete the work already begun. At the same time, he offered to have all of the specimens in Hawaiian collections shipped to me and generously placed all of his notes, dissections, and drawings at my disposal. All of this material is now before me as a result of this kind offer and of the assistance of Mr. Swezey, who shipped much of it.

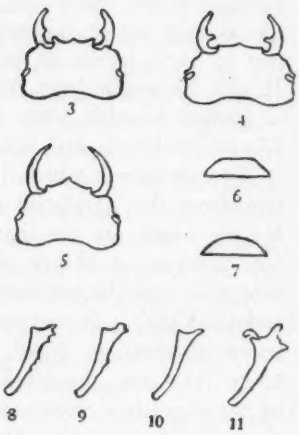
The genus *Apterocyclus* is peculiar in that it is wingless and without a labrum. It was stated by Waterhouse to be somewhat related to the Chilian genus *Sclerostomus,* but by Sharp supposed to be closer to the genus *Dorcus,* and to this latter view I agree. In fact, all specimens seen appear superficially like very degenerate and chubby species of *Dorcus.* Among the individuals of the genus there is also a very great amount of variation. I have had the opportunity to study one hundred and thirty-six specimens and as a result of this, supplemented by a careful examination of the dissections and drawings of the genitalia of numerous divergent forms, made by Mr. Giffard, have come to the conclusion that there is but one species, *honoluluensis,* and that all other so-called species are but variants of this. It seems to me that we have here a case of a species of *Dorcus* or of a closely related genus having become established at a very ancient time on what is now the island of Kauai, and of having undergone subsequent to that time a great degree of modification, chiefly along lines of degeneration. The species having once lost its stable status, soon acquired a great deal of plasticity which has been retained to the present date. The degeneration is shown in such ways as the absolute loss of wings and the resulting reduction of the entire afterbody, particularly evident in the shortening of the metathorax, as is clearly to be seen beneath in the very short metasternum, and the shortening and rounding of the elytra, a character that is always to be noted in species which have been long without wings; the loss of the labrum; and the shrinking of the integument, particularly noticeable in the elytra of the males. The species has undoubtedly developed its subterranean habits[3] with the resulting enlargement of legs,

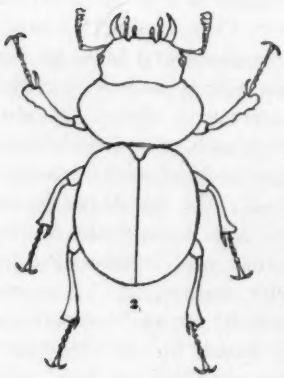
[3] Mr. Kusche told me that he found practically all of his specimens in old rotting stumps or at the base of the same, and that sometimes they were some distance below the surface.

though there has been no appreciable reduction or other modification of the fore tarsi, as is so often found in fossorial Lamellicornia. The males show the usual Lucanid tendency to vary as regards the mandibles, the head, and prothorax; and the species as a whole, the tendency of lignivorous insects in general to vary greatly as to size. The largest males are fully 21 mm. in length from clypeus to apex of elytra and 11 mm. in greatest breadth, while the smallest specimen seen is hardly 12 mm. in length and 6 mm. in breadth.

The structures which I have found to be the most important from the standpoint of variability and useful as indices for my work, are the mandibles, the clypeus, the submentum (the mentum of earlier authors), the sides of the head, the fore tibia, and the scutellum, and to a lesser degree the middle and hind tibia. In no two specimens from the large number under observation, could I find all of the characters absolutely the same, though in the majority a certain proportion of the characters were alike. As regards the mandibles, there were found four main types: the first, the generalized and usual form with a moderately developed and acute tooth at about the middle, such as is shown in Plate I, fig. 1; second, a form with the tooth much more elongated and blunt at the tip and also projecting somewhat upwards as well as inwards, fig. 4; third, a form with greatly elongated, almost straight, and toothless mandibles, fig. 5; and fourth, a much reduced simple type of mandible with at most only a slight enlargement where the tooth should be, fig. 2. The first three forms are only found in the males and the last is restricted to the females. The clypeus shows that it may vary in three distinctive ways: have a transverse anterior margin, fig. 1; a pronounced bi-emarginate anterior margin, fig. 3; or be somewhat triangular with the middle much produced, fig. 5. The sides of the head are almost straight and parallel in a few, with the canthus not prominent and not impinging upon the anterior portion of the eye, fig. 3; somewhat rounded and with a well developed, more or less tuberculous canthus that decidedly overlaps the anterior margin of the eye, fig. 1; and quite oblique and converging anteriorly, with but a moderate development of the canthus, though with the same slightly im-







Apterocyclus and Rhynchogonus.

pinging upon the eye, fig. 5. The anterior tibia may have the outer margin multidentate, fig. 8; may be somewhat simple in outline, fig. 10; or have the apex decidedly tripalmate, fig. 11. Composite types may also be found as in fig. 9. The scutellum is normally moderately prolonged and evenly rounded at the apex as shown in figs. 1 and 2, but in a few it is much shortened, greatly elongated and with parallel sides, or quite triangular and acute at the apex. The middle and posterior tibia may be simple and untoothed as with the majority, or provided with an acute tooth at about the middle as was no doubt the ancestral condition. Other characters are also variable, but they are of less value for purposes of differentiation. The male genitalia have been carefully studied by Mr. Giffard. I have critically examined the mounted dissections which he made from various forms, together with his drawings, and can find no differentiating characters of moment, though there were noted minor modifications. These latter, I believe, are mainly due to the changes which have been produced in the parts by mounting rather than to any material difference in the structures themselves. The male genitalia do, however, show distinctive generic characters. Plate II, which is made from one of Mr. Giffard's careful drawings, will give a good idea of the distinctive features, and enable anyone who wishes to contrast them with those found in other genera of the Lucanidae.

Studying the specimens themselves in regard to the struc-

EXPLANATION OF PLATE I.

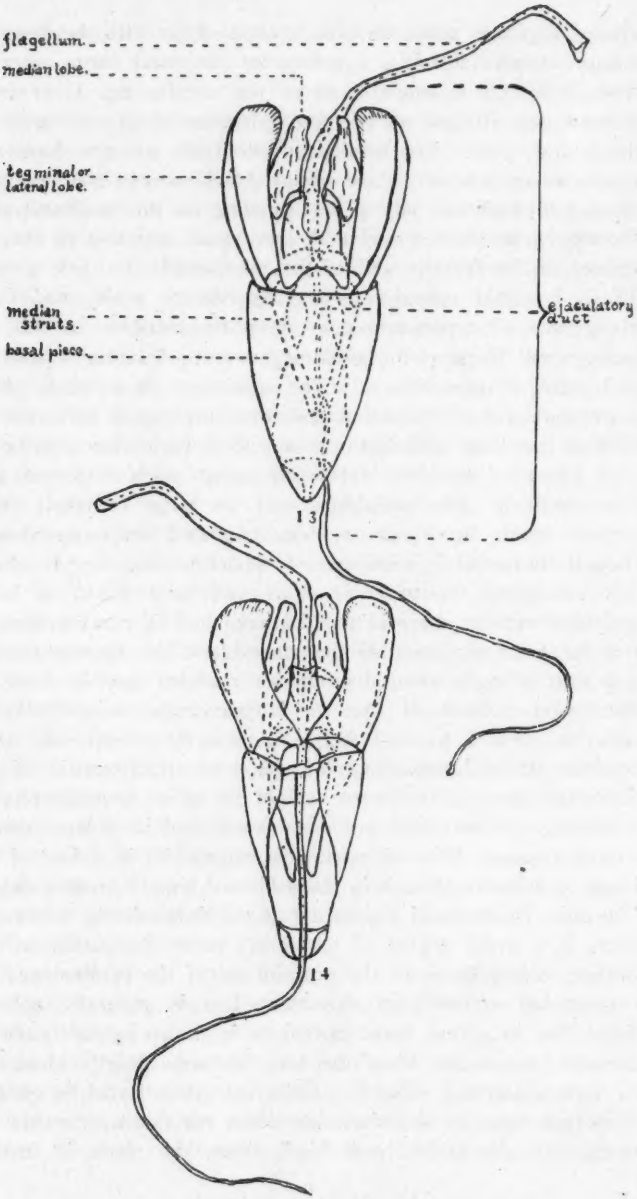
Fig. 1, Male of Apterocyclus honoluluensis Waterhouse (typical form).
Fig. 2, Female of Apterocyclus honoluluensis Waterhouse (typical form).
Fig. 3, Head of Apterocyclus honoluluensis var. waterhousei Sharp (typical).
Fig. 4, Head of Apterocyclus honoluluensis Waterhouse (atypical form).
Fig. 5, Head of Apterocyclus honoluluensis var. palmatus n. var.
Fig. 6, Submentum, trapezoidal form.
Fig. 7, Submentum, simple or arcuate form.
Fig. 8, Fore tibia, the multidentate form.
Fig. 9, Fore tibia, a composite form.
Fig. 10, Fore tibia, a simple or reduced form.
Fig. 11, Fore tibia, the tripalmate form.
Fig. 12, Rhyncogonus alternatus n. sp.

tures indicated above, I found that they could readily be put into four main assemblies or groups. Three of these would include only males and the fourth only females. The three male types are sufficiently distinctive to be listed as varieties. The female type is fairly constant, the males less so, some being intermediates between two or more of the dominant types.

The members of the first group, I would in general characterize as being quite large and robust and with sides somewhat parallel; the head with moderately well developed and toothed mandibles, the clypeus bi-emarginate in front, and with the sides almost parallel and with the canthus but moderately developed and not or but slightly impinging upon the eye, fig. 3; a prothorax, large and with sides almost straight; the fore tibia large and multidentate on the outer margin; the middle and hind tibia each with a well developed and acute tooth near the middle, the scutellum of the normal type, fig. 1; and the submentum of the trapezoidal type, fig. 6. Two of the specimens before me are of this type, both collected by Mr. Kusche near the Waialae river, Kauai, and now belonging to Mr. Giffard. *Apterocyclus waterhousei* Sharp would also belong here. The elytra in this last are spinous at the sutural apex and the anterior margin of the clypeus somewhat truncate according to the illustration, but these are divergent and individual characters and of less value than are the characters which associate it with the others. The individuals of this group I would consider as most generalized and closest to the ancestral stock. The large size, more parallel form, smooth mahogany colored surface, and many toothed anterior tibiae, show that they have departed the least from their progenitors. The possession of wings and labrum and the general development which wings would require would make them almost typical species of *Dorcus*.

The second group, I would consider as including the specimens approximating the type of the genus, *Apterocyclus honoluluensis* Water., or like the one outlined in fig. 1. These would in general have moderately developed and toothed mandibles, the clypeus with a truncate or straight anterior margin, the head with the sides somewhat rounded though slightly angulated because of the development of the canthus, which

always impinges upon the eyes, a submentum with the anterior margin arcuate, fig. 7, a scutellum of the usual form, anterior tibia with only a single tooth at the middle, fig. 1, or even without, fig. 10, and middle and posterior in general without the lateral tooth. The beetles included here are the dominant forms. They are very dark, almost black, and in general quite opaque throughout, only a few showing on the head and prothorax the smoothness and mahogany color which is so characteristic of the females and of the members of the first group. These I would consider as having become most specialized along lines of degeneration. Among the members in this assembly will be seen the greatest amount of minor variations and signs of unstableness. The specimens as a whole show a great degree of reduction and simplification of structure as well as peculiar modifications and they vary also greatly in size, many of the less developed being much distorted and asymmetrical. The mandibles may be large or small, have a large tooth, fig. 4, or one much reduced but never absent, though the usual is with one of moderate size, fig. 1. In a few specimens the tooth is short and very broad at base, and in a number there is an additional but very small denticle not far from the apex of the mandible. The clypeus though generally straight along its anterior margin, may in some of the larger individuals show a bi-emarginate margin though never to such a marked degree as seen in group one, or a tendency toward the triangular shape so characteristic of the following group. In one or two of the more extreme phases, the margin is retracted and emarginate and in several almost evenly arcuate. The submentum is trapezoidal in a few of the larger specimens, though in the majority, simply arcuate, fig. 7. The sides of the head are, as a rule, as shown in fig. 1, though there is a great degree of variability as to the details of the outline, especially as to the prominence of the canthus and its relationship to the eye. The scutellum is generally normal, fig. 1, but in a few, great instability is shown by its assuming unusual shapes, as when the lobe becomes greatly elongated or quite triangular. The fore tibiae are, as indicated, in general quite simple as to the shaft but often variable as regards the apex. In the middle and hind tibiae, the shaft is usually



Male genitalia of Apterocyclus.

simple, though often definitely toothed. Most of the specimens seen came from an altitude of from three thousand to over four thousand feet, as from Kokee and Puu Ka Pele, on the island of Kauai, and were collected during May or June. I believe that from this group will develop the dominant and perhaps stable type of the future if the species persists. At present, however, there is great instability. Among the described forms I would assign to this group besides *Apterocyclus honoluluensis* Water., previously mentioned, *A. munroi* Sharp, *A. adpropinquans* Sharp, *A. varians* Sharp, and *A. deceptor* Sharp, so-called species which are but slightly different, each in its own way, from the bulk of this group. If I were to name other new forms, basing them upon the same degrees of modification, noted for the above, I would need to designate at least fifty new forms, for, as I have previously stated, hardly any two specimens have the same structures modified in the same way and to the same degree.

The third group will include a number of individuals which are primarily characterized by being quite large, robust, and decidedly opaque. They have much elongated and untoothed mandibles, fig. 5, a triangular clypeus, and fore tibiae very robust and markedly tripalmate at the apex, fig. 11. In one specimen, the submentum is arcuate anteriorly, in the others, trapezoidal. In all other regards, they resemble the members of group two and show the same degree of variability as regards character. Five specimens of this phase are now before me, one belonging to the Bishop Museum, one to Mr. Giffard, and three to me, all collected by Mr. Kusche at an altitude of four thousand feet on the island of Kauai. This very distinct phase, I consider worthy of a name so will call it the variety *palmatus* n. var. and designate one of my specimens as the type, the other specimens as paratypes. It is a

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EXPLANATION OF PLATE II.

Fig. 13, Male genitalia of Apterocyclus honoluluensis Water., upper side.
Fig. 14, Male genitalia of Apterocyclus honoluluensis Water., under side.

Figs. 13 and 14 are copied from drawings made by Mr. W. M. Giffard, and the parts are named according to the nomenclature of Sharp and Muir.

form which has become extremely modified along peculiar lines and seems to indicate that it is being adapted to a subterranean life. The long, almost straight, and porrect mandibles and heavy, fossorial anterior tibiae are such as one usually finds in insects leading a burrowing life.

The fourth group includes only females. Those which I have seen are of rather small size, averaging 18 mm. in length from clypeus to apex of elytra, are somewhat shining and of a rich mahogany color, have short and simple or untoothed mandibles, the clypeus with a straight anterior margin or merest indication of being bi-emarginate, a submentum that is more or less trapezoidal, and anterior tibiae that are always well developed apically and have a few lateral denticles, fig. 2. In two of the specimens under observation, the middle and posterior tibiae have a small tooth near the middle, but in the remainder the tibiae are simple. These females are also very hairy beneath, body as well as legs, and this degree of pilosity is never approached by any of the males. Seven specimens have been examined, one belonging to the Bishop Museum, one to the collection of the Hawaiian Sugar Planters' Association, one to Mr. Giffard, and four to me. The second specimen mentioned was captured by Mr. H. T. Osborn at Kokee, Kauai, June 11, 1919, and in company with eleven males of group two. The others were found by Mr. Kusche at an altitude of four thousand feet on Kauai, and in company with specimens of group three and a large series belonging to group two. The only other female that I know of is the one described as *Apterocyclus feminalis* Sharp which, according to the description and figure is not appreciably different from those seen by me.

Thus to sum up, I would state that, according to my judgment, there is but one species of the family Lucanidae in the Hawaiian Islands, *Apterocyclus honoluluensis* Waterhouse. The female of this, separately described as *Apterocyclus feminalis* Sharp, is readily separated from any of the males, by good characters, and is also fairly stable. The males, on the other hand, are markedly unstable and polymorphic, though as far as known examples show, they appear to be specialized in general in three ways: first, towards a retention of many of the primitive characteristics as is shown by members of the

first group, which might be designated by the name *waterhousei* Sharp and listed as a phase or variety of the species *honoluluensis* Water.; second, along lines of degeneration and simplification of structure, including all members of my second group, and to be designated as the typical form; and third, along lines of great modification as regards the mandibles and anterior tibiae, a result, I think, of becoming more adapted to a subterranean mode of life, producing a phase which I would designate as the phase or variety *palmatus* n. var.

For the opportunity to study this most interesting group of beetles I must thank the following good friends: Mr. W. M. Giffard, Mr. Preston Clark, and Mr. O. H. Swezey. Mr. Giffard in particular aided me in every way that was possible.

A New Species of Rhyncogonus (Rhynchophorous Coleoptera), from the Island of Kauai, Hawaiian Islands.

BY EDWIN C. VAN DYKE,

University of California, Berkeley, Cal.

(Presented by title by W. M. Giffard at the meeting of December 1, 1921.)

Rhyncogonus alternatus n. sp.

Robust, very convex, blackish-brown, the tibiae and tarsi somewhat reddish; head with rostrum slightly longer than diameter across the eyes and coarsely, somewhat strigosely punctured above, the punctures of the front more rounded, and finer posteriorly, the surface sparsely clothed with light-brown hair, denser in the supraorbital region, the antennae with the first and second joints of the funiculus of about equal length; the prothorax broader than long, with sides almost parallel in basal half and slightly rounded and convergent anteriorly, the disc coarsely, cribrately, and irregularly punctured, with a smooth median longitudinal line, the surface sparsely pilose, like the head but with a tuft of lighter colored hair near the posterior angles; the elytra somewhat longer than broad and twice as broad as prothorax, very convex, even in the male, and with the carinate margin only evident near the humeri, the

disc with rows of large and well-impressed punctures, the intervals flat except every fourth which is a bit convex and more elevated, the surface densely clothed with moderately long reddish-brown pile which is inclined to be collected into tufts and somewhat vittately arranged, the vittae on the more elevated intervals being especially prominent. Beneath, the body is coarsely closely punctured and sparsely finely pubescent. Male, length, 10 mm., breadth, 5 mm.; female, length, 12 mm., breadth, 6 mm. Plate I, fig. 12.

This species is evidently somewhat related to *Rhyncogonus depressus* Sharp. and *Rhyncogonous vittatus* Sharp, differing primarily from both by being very convex, also by the color of the pile and its arrangement. In *depressus*, the pile is uniformly arranged and closely appressed; in *vittatus*, arranged in series of somewhat regular vittae; while in *alternatus*, it is not only somewhat longer and coarser, but darker, and inclined to be so dispersed that the covering of every fourth interval is more prominent. In drawing up this description, I have examined twenty-eight mounted specimens from my collection, and previously had seen several times that number, all collected near a swamp, at an altitude of about four thousand feet, on the island of Kauai, during June, 1919, by Mr. J. August Kusche.

Type male and allotype female in my collection, also several others designated as paratypes, a pair of which will be deposited in the Bishop Museum, Honolulu, and the California Academy of Sciences, San Francisco.

Identity of the Hawaiian Carpenter Bee of the Genus Xylocopa (Hymenoptera).

BY P. H. TIMBERLAKE.

(Presented at the meeting of January 6, 1921.)

The Hawaiian carpenter bee has been established in the Islands for many years, and was first collected by Blackburn. F. Smith (Journ. Linn. Soc. London, 14, p. 684, 1879), and W. F. Kirby (Entom. Mo. Mag., 17, p. 86, 1880) both identified the species as *Xylocopa aeneipennis* (De Geer), which is now commonly synonymized with *X. brasilianorum* (Linn.). This identification has been followed by most later writers, including Perkins (Fauna Hawaiiensis, I, p. 113, 1899) and Maidl (Ann. k. k. Naturh. Hofmus., 26, p. 307, 1912).

In 1899, Alfken (Entom. Nachr., 25, pp. 317, 318) pointed out the differences between our insect and *brasilianorum* and identified it with *X. chloroptera* Lep. from China and the East Indies, but later retracted this determination, using the name *brasilianorum* in 1903 (Zool. Jahrb., 19, p. 576).

Our insect, however, is strictly identical with a species common in Southwestern United States, which was described as *X. varipuncta* by Patton in 1879 (Canad. Entom., 11, p. 60).* Females from Whittier, California, and Hawaiian specimens agree exactly even in the minutest details of puncturation. It is likely, therefore, that the species was introduced from California instead of from South America, as formerly supposed. Maidl also records (l. c., p. 264) a female *brasilianorum* from Japan, and it would be interesting to know whether this is also *varipuncta*.

* Since this note was presented, Dr. T. D. A. Cockerell has examined Hawaiian specimens and pronounces them to be exactly *varipuncta*, which he considers to be distinct from *brasilianorum*. Mr. S. A. Rohwer has also kindly compared specimens with others in the U. S. National Museum from Arizona, and finds them to be identical.

Observations on Xylocopa and Lithurgus (Hymenoptera).

BY W. M. GIFFARD.

(Presented at meeting of January 6, 1921.)

On December 22, Mr. Muir and I were at Waialua and observed the males of *Lithurgus albofimbriatus* swarming around the exit holes of *Xylocopa varipuncta* in part of an old tree-trunk, which had been utilized as a fence-post. It was quite evident that the males were waiting for the emergence of females. At the time no *Xylocopa* were noticed in the immediate neighborhood. Five days later, December 27, I again visited the place for the special purpose of cutting away a portion of the fence-post for further study and examination. The swarming of *Lithurgus* males, previously noticed, had entirely ceased. In a wait of one hour only two solitary specimens on the wing were seen in the immediate neighborhood (one male and one female), but *Xylocopa* were flying around the post, entering and emerging from their burrows in numbers.

Bringing the cut sections to Honolulu and bagging them for better observation, emergence of both *Lithurgus* and *Xlyocopa* began on the day following in large numbers, so that at the expiration of seven days nineteen males and twenty-three females of *Lithurgus* and twenty-two males and twenty-seven females of *Xylocopa* had emerged from two sections of post, measuring in all 2½ feet by 8 inches in diameter. (Note.—A large proportion of the *Lithurgus* and some of the *Xylocopa* were found to be attacked by large swarms of Acari. These had massed themselves in swarms to the propodeum and anterior segments of the abdomen.)

Upon opening the sections for further observation, the channels of both *Lithurgus* and *Xylocopa* were plainly seen, together with many old cocoons of the former and others containing pupae. The larvae of *Lithurgus* were not observed, nor were the pupae of *Xylocopa* seen. It is safe to say that quite a few more *Lithurgus* would have emerged had the splitting of the sections of the post been further postponed. There

remained in the channels two males and one female, and one partly grown larva of *Xylocopa.*

In addition to the above Aculeates, the sections of post contained large swarms of *Pheidole megacephala,* which had taken possession of the old channels of the *Lithurgus.* It was observed by Muir and Timberlake at the time the sections were split that *Lithurgus* apparently filled up the most of its old channels by the frass taken from those newly constructed, this frass even tightly packing up the interior of the old cocoons.

From beneath the bark and in some of the channels were swarms of the Tenebrionid beetle (*Alphitobius piceus*); also one example of *Oxydema fusiforme,* also a number of small Roaches, one Centipede, and the larva of an Elaterid beetle.

Insect Collecting in Zero Weather in Illinois.

BY O. H. SWEZEY.

(Presented at meeting of March 3, 1921.)

The week before Christmas, December, 1920, I spent at a farm house near Rockford, Ill. It was hardly a favorable time for collecting insects, as for a part of the time the temperature dropped as low as zero. However, a few interesting captures were made, which are now exhibited.

In a cavity in the center of a block of wood, recently brought in from the forest, was found a colony of the large black wood ant, *Camponotus pennsylvanicus* (Deg.), of which a series of specimens was secured. Among these ants some queer brown insects were noticed, and sixteen of them were collected. These proved to be a species of Staphylinid beetle, *Xenodusa cava* (Lec.), which is an inquiline in ants' nests. I had never before seen any of these insects. The ants feed the beetles and their larvae, and they in turn lick the clusters of hairs on the sides of some of the adbominal segments of the beetles. An account of this is given in Wheeler's Ant Book.

In another cavity, which was an old channel of some wood borer, opening out to the exterior, was a mud nest of some wasp, containing several cells in a mass. From this mud nest, four pretty, white-marked Ichneumonids * issued the latter part of February; also 143 small *Tetrastichus* issued during the middle of the same month. The latter were determined as *Tetrastichus johnsoni* Ashmead, by Mr. Timberlake.† One wasp, *Ceropales fraterna* Smith, issued March 3. From what has been previously observed of this wasp, it may have been a parasite on the wasp which was the builder of the nest. If so, the true builder of the nest was not learned, for the total emergences are given above. On examination of the eight cells of the nest, one cell contained the cocoon of the *Ceropales fraterna;* four cells contained the cocoons of the Ichneumonids; two cells contained cocoons of the Ichneumonid from which

* *Mesostenus discoidalis* Cresson, as determined later by R. A. Cushman.

† Identification confirmed by Mr. A. B. Gahan by comparison with types in the U. S. National Museum.

the *Tetrastichus johnsoni* had issued, thus proving the host of this parasite; the remaining cell contained a cocoon of the Ichneumonid with a dried-up larva.

It was not possible to determine the host of this Ichneumonid. But it must have been either the *Ceropales fraterna*, or if this wasp was a parasite on some other wasp (possibly an *Agenia*) that may have built the nest, the Ichneumonid might have been a parasite on the *Agenia*.

In similar blocks of wood were found many larvae of two or three Longicorn beetles, and possibly of Buprestids as well. None were collected, nor were any adults found, or remains of any adult beetles that might be a help to the identification of the larvae. Beneath the bark where beetle larvae had been working, three cocoons were collected, from which one Braconid‡ issued. It probably was a parasite on some one of the beetle larvae.

‡ *Atanycolus* sp., as determined later by S. A. Rohwer.

Insects Attacking Ferns in the Hawaiian Islands.

BY O. H. SWEZEY.

(Presented at the meeting of March 3, 1921.)

In a recent paper by Dr. Charles T. Brues on "The Selection of Food-plants by Insects, With Special Reference to Lepidopterous Larvae," * he says, "The term phytophagous with reference to insects is commonly employed in a considerably restricted and rather inaccurate sense, including only those species that feed upon the higher plants, meaning by these the ferns and flowering plants. Only an extremely small, almost negligible, proportion subsist upon ferns, so that from a practical standpoint, we would include only those feeding upon the Spermatophytes."

It is to be presumed that Dr. Brues has in mind conditions of his region, the Eastern United States, when he says an almost negligible proportion of insects subsist upon ferns. Here in the Hawaiian Islands a considerable number of insects subsist exclusively upon ferns, besides quite a number of others which are more or less associated with them.

During the seventeen years that the writer has been engaged in economic entomology in the Hawaiian Islands, the study of the habits, host-plants, life histories, parasitic relations, etc., of the endemic insects have received considerable attention as well as have the introduced insects which were of economic importance. In becoming familiar with the endemic insect fauna of the Hawaiian Islands, one soon learns that the different species are largely attached to particular trees or plants, and conversely that each species of tree or plant has its own peculiar insect fauna—one or more species of insects which feed upon it exclusively. Following out this phase of the insect relations to the plants, much attention has been given to the study of the insect faunas of some of the more important native trees which seemed to have a larger insect fauna than many of the other species.

Along these lines, the native ferns in the Hawaiian Islands have come in for their share of similar consideration. The

Proc. Haw. Ent. Soc., V, No. 1, October, 1922.

* American Naturalist, LIV:313, 1920.

Hawaiian Islands are rather rich in ferns, from very small moss-like species to large tree-ferns, about 130 species in all, and there is found to be quite an extensive insect fauna peculiar to these ferns. Perhaps not every species of fern is attacked by insects, but there are quite a number which have one or more species of insects peculiar to them. Information on these insects accumulates slowly, and is as yet far from complete, but the following are known at present:

LEPIDOPTERA.

Eriopygodes euclidias (Meyrick). [Caradrinidae.]

This moth is very abundant in the forests where ferns abound. Its caterpillar is the cutworm type, though it remains on its food-plant in daytime instead of hiding under rubbish or in the soil. They feed on many kinds of ferns, and apparently only on ferns. The caterpillar varies from nearly plain green to almost black.

Scotorythra rara (Butler). [Selidosemidae.]

Caterpillars of this moth are very polyphagous, mostly feeding on trees, but they have also been found feeding on ferns. They occur on all the islands of the group.

Batrachedra sophroniella Walsingham. [Hyponomeutidae.]

The larvae of this moth feed on the sporangia of *Aspidium cyatheoides,* protected by a web. When there are no more sporangia, they feed on the undersurface of the frond, eating away the parenchyma and leaving the upper epidermis which then shows as dead spots. Pupation takes place within a cocoon alongside of the midrib of a pinna. This moth is known on Oahu, Maui, and Hawaii. I have taken it at Pauoa, Mt. Tantalus, Pacific Heights Ridge, Hillebrand's Glen, Halawa, and Waiawa on Oahu; Keanae, Maui; Waimea, Hawaii.

Batrachedra lomentella Walsingham. [Hyponomeutidae.]

This species has similar habits, but the identity of the fern to which it is attached cannot be stated with certainty. The moth is known on Oahu and Hawaii. I reared it from unidentified ferns in Hakalau Gulch, Hawaii; and Palolo, Oahu.

Batrachedra bedelliella Walsingham. [Hyponomeutidae.]

The larvae of this tiny moth feed among the sporangia of

the birdnest fern, *Asplenium nidus*. I have reared them from Palolo, Oahu, and Hakalau, Hawaii. They no doubt occur on all the islands where this fern does. In the Fauna Hawaiiensis the species is recorded from Maui and Molokai. I have found larvae feeding among the sporangia of *Elaphoglossum reticulatum* in Palolo Valley, Oahu, which I failed to rear. It may be the same species, and yet it might be still another species of the same genus.

Batrachedra syrraphella Walsingham. [Hyponomeutidae.]

The larvae of this species feed on the sporangia of *Dryopteris parasitica*. They hide within a white silken tunnel produced wherever they are feeding. I have reared it from Palolo Valley and from Waianae, Oahu; and have collected it besides at Niu, Wailupe, Kaumuahona, Hillebrand's Glen, Waiahole and Kaala, Oahu. In the Fauna Hawaiiensis it is also recorded from Kona and Kilauea, Hawaii.

Batrachedra sp.

I found fronds of *Pteris irregularis* on Mt. Tantalus, Oahu, very much mined by a small larva which was taken to be of a species of *Batrachedra*, but no adults were reared to prove their identity.

Batrachedra spp.

There are four other native species of this genus whose habits are not known, but it is likely that they may be found to be attached to some of the ferns.

At several places in the mountains of Oahu, *Polypodium spectrum* fronds have been found mined by a lepidopterous larva larger than the preceding. None have been reared, however, so that the species of moth is yet unknown.

Euhyposmocoma ekaha (Swezey). [Hyponomeutidae.]

The larvae of this moth feed singly on the underside of the fronds of *Asplenium nidus*. They eat off the parenchyma, leaving the upper epidermis which shows as dead patches. While feeding, the larva is protected by a covering of silk and frass, making a sort of covered way connected with a burrow in the midrib where the larva stays when not feeding. This covered way is shifted as the eaten-off area enlarges in size. This moth occurs wherever this species of fern is found in the

numerous mountain valleys of Oahu, but has not yet been found on the other islands.

Euhyposmocoma trivitella Swezey. [Hyponomeutidae.]

The larvae of this moth are miners in the simple sterile fronds of *Elaphoglossum reticulatum,* and have been found only on the east side of the mountains of Kauai.

Hyposmocoma spp.

Several undetermined species of these tiny moths are associated with ferns. The larvae live in cases, and several kinds of these cases have been found on fern fronds or in dead, decaying frond-stalks of tree-ferns. Possibly they are not particularly attached to the ferns as host-plants. This remains to be determined.

COLEOPTERA.

Heteramphus filicum Perkins. [Cossonidae.]

This weevil is found in rotting tree-fern trunks or stumps on Oahu. As yet it is not known to have any other habitat, and is considered a fern insect.

Heteramphus wollastoni Sharp.

Heteramphus foveatus Sharp.

These two closely related species are also occasionally found in similar situations as *filicum* on Oahu, but their usual food-plant is *Astelia veratroides.*

Heteramphus swezeyi Perkins. [Cossonidae.]

The larvae of this species are miners in the sterile fronds of *Elaphoglossum reticulatum, micradenium, gorgonum* and *squamosum.* They pupate and develop to the adult beetle within the mine. The species has been observed chiefly in Palolo Valley, Oahu, but has been taken also at Punaluu towards the opposite end of the same mountain range, and its mines have been observed at Wahiawa about the middle of the range; hence, it apparently occurs throughout the range. It has not yet been found on the other Islands.

Oodemas brunneum Perkins. [Cossonidae.]

This weevil occurs in dead frond-stalks of *Pteris* on Molokai.

Oodemas aenescens Bohman. [Cossonidae.]

This species occurs in dead frond-stalks of *Cibotium* spp.

on Oahu and Lanai. It is not confined to ferns, however, for it also occurs in dead branches of many kinds of trees and shrubs.

Pentarthrum prolixum Sharp. [Cossonidae.]

This elongate weevil is found, often abundantly, in the dead frond-stalks of two or three species of *Cibotium*, tree-ferns. It does not occur on anything else. It is common on all the Islands.

Dryophthorus pusillus Sharp. [Cossonidae.]

This weevil occurs on Oahu, and inhabits decaying tree-ferns, *Cibotium* spp.

Dryophthorus modestus Sharp. [Cossonidae.]

This species occurs on Oahu, Maui, and Hawaii, and is rarely found in similar places to the preceding.

Dryophthorus insignis Sharp. [Cossonidae.]

This species occurs on all the Islands and is more often found on tree-ferns, inhabiting the dead frond-stalks. The species of the genus *Dryophthorus* usually feed in rotten wood, and it is likely that some of the other species may also be found in decaying fern-stems.

Pseudolus longulus (Boh.). [Cossonidae.]

The larvae of this weevil feed in the dead frond-stalks of *Cibotium chamissoi*. They also feed in dead bamboo and other dead or rotten wood. It occurs on all the Islands.

Proterhinus longulus Sharp. [Proterhinidae.]

This representative of the endemic family Proterhinidae is found on tree-ferns (*Cibotium chamissoi, C. menziesii*). The larvae feed in the dead frond-stalks. The species occurs only in the forests of Oahu.

Proterhinus pteridis Perkins. [Proterhinidae.]

This species occurs on Molokai, in the leaf-stalks of a species of *Pteris*.

Proterhinus sharpi Perkins. [Proterhinidae.]

This species occurs on Haleakala, Maui, on a non-arboreal fern. A number of other species of *Proterhinus* are commonly

swept from ferns, and it is likely that they will be found to be attached to them when their habits are fully studied.

Holcobius hawaiiensis Perkins. [Ptinidae.]

This beetle has been taken at base of tree-ferns.

Nesapterus monticola (Sharp). [Nitidulidae.]

I found two specimens of this beetle in the dead frond-stalk of *Cibotium menziesii* in Palolo Valley. Otherwise the habits of the species are not known.

DIPTERA.

Drosophila sp. [Drosophilidae.]

An undescribed species of this genus has been reared from living frond-stalks of *Sadleria cyatheoides* at Niu, Oahu, and at Kilauea, Hawaii. The larvae are found in the very young fronds. They are very elongate, and tunnel up and down in the stem. There is hardly a frond to be found on any plant of this fern that has not several of these tunnels, but the fern does not seem to be seriously injured by them.

Agromyza sp. [Agromyzidae.]

An undescribed species of this genus is a miner in the fronds of *Marattia douglassi.* The mines are often very abundant, but very few adults have been reared. It occurs on Oahu, and possibly on the other Islands wherever the fern occurs.

HOMOPTERA.

Oliarus kaonohi Kirkaldy and **O. montivagus** Kirkaldy of the Cixiidae have been reared from nymphs occurring in decaying frond bases and in the fibrous matter of tree-fern stems, and in the dead frond-stalks. It is likely that several of the other species of this genus are also attached to ferns, for many of them are taken by sweeping on ferns. It is probable that the near-related *Iolania perkinsi* Kirkaldy may be found to breed similarly, for the adults are commonly collected from ferns.

Ilburnia ipomoeicola Kirkaldy. [Delphacidae.]

This small leafhopper is associated with *Sadleria cyatheoides.* It oviposits very abundantly in the young tender frond-stalks. It has been reported on *Cibotium,* and also occurs on

a few other plants. It is known on Kauai, Oahu, and Hawaii.

Ilburnia amamau Muir. [Delphacidae.]

This species occurs on *Sadleria cyatheoides* on Haleakala, Maui.

Ilburnia nephrolepidis (Kirkaldy). [Delphacidae.]

This species occurs on *Nephrolepis exaltata.* It has been collected at Maunawili, Oahu; Iao Valley, Maui; Ookala and Kilauea, Hawaii.

Nesorestias filicicola Kirkaldy. [Delphacidae.]

Has been collected from *Elaphoglossum gorgonum,* and possibly other ferns. Palolo, Pacific Heights and Tantalus, Oahu.

Nesorestias nimbata (Kirkaldy). [Delphacidae.]

Has been collected on *Phegopteris* sp. and may occur on other ferns. Collected at Kaumuahona, Waiawa, Waiahole and Punaluu, Oahu.

Nothorestias badia Muir. [Delphacidae.]

Collected on undetermined ferns at Kuliouou, Oahu.

Nothorestias swezeyi Muir. [Delphacidae.]

Collected on *Aspidium* sp. at Makaha, Oahu, 1500 feet elevation.

There are likely other species of Delphacidae yet to be discovered that are attached to some of the different ferns.

Nesophryne filicicola Kirkaldy. [Tetigoniidae.]

Nesophryne microlepiae Kirkaldy.

These two species were recorded from *Microlepia strigosa,* Kalihiwai, Kauai.

Idiopterus nephrolepidis Davis. [Aphididae.]

This aphidid is often found on *Elaphoglossum reticulatum* and some other native ferns, and by some is considered a native insect.

ORTHOPTERA.

Paratrigonidium filicum Perkins. [Trigonididae.]

This small cricket was found by Perkins at Olaa, Hawaii (two thousand feet), "in dense forest, frequenting a tall soft fern, which covers the ground beneath the trees."

Paratrigonidium viridescens Perkins. [Trigonididae.]

This cricket was found in the same locality as the preced-

ing species, but it "lives among a beautiful creeping fern, which clothes the tree-trunks in wet forests."

Banza spp. [Locustidae.]

Adults and young of several species are often found on ferns.

PREDATORS.

Several species of native Carabidae are always to be found in dead or hollow frond-stalks and decaying tree-fern stems, where they are in search of prey. An occasional predacious bug, and earwigs are also found in these places, as well as the peculiar crickets *Prognathogryllus* and allies.

None of the native insects occurring on ferns in the Hawaiian Islands are particularly injurious to the ferns which they infest. There are parasites working on them, which largely accounts for their control. There is no telling, however, but what they might prove serious pests, if by any chance some of them became introduced into other countries, just as the Australian fern-weevil has done in Hawaii.

Besides the endemic insects, a few others are sometimes found on ferns in the forests of Hawaii; as, for example, the wax scale (*Ceroplastes rubens Maskell*) on *Elaphoglossum reticulatum* and other ferns, and some of the other introduced scales on different ferns, but none of them are of any consequence.

Syagrius fulvitarsis Pascoe. [Molytinae.]

This is known as the Australian fern weevil,* which first appeared in fern-houses in Honolulu, and then a little later (about 1904) became established in the open and spread to a considerable extent in the mountains in the immediate vicinity of Honolulu, practically exterminating one of the most abundant ferns (*Sadleria cyatheoides*) and a species of *Asplenium*, but not harming the tree-ferns (*Cibotium* spp.) nor other ferns. The chief injury is done by the feeding of the larvae in the frond-stalks, killing them prematurely, and eventually causing

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* *Ischiogonus syagrii* Fullaway, a parasite on the fern weevil, was discovered in Australia by C. E. Pemberton in April, 1921, and introduced to Hawaii. It became established quickly, but it yet remains to be demonstrated whether it will become as effective here as in Australia in controlling the pest.

the death of the whole plant. In 1909, it was found to have become established in a fern-house in Hilo on the Island of Hawaii. Attempts were made to eradicate it there, but later on it was found generally spread throughout the town, and by 1920 had extended its spread to some distance outside. A considerable colony was found at a distance of twenty-nine miles and at an elevation of nearly four thousand feet, near the volcano Kilauea, where there are extensive tree-fern forests, in places chiefly composed of *Sadleria,* which were thus threatened with destruction as they had been in the mountains near Honolulu. Strenuous measures were employed by the Territorial Board of Agriculture to eradicate the weevil in that place, with as good success as has ever been attained in the destruction of an insect pest that has once become thoroughly established.

Description of a Cuckoo-wasp from the Hawaiian Islands (Hymenoptera).

BY S. A. ROHWER.
Bureau of Entomology, Washington, D. C.
(Presented at the meeting of August 4, 1921.)

So far only one species of Chrysididae has been recorded from the Hawaiian Islands, and it seems to be undescribed. It has, however, been known to the entomologists of the Islands only since June, 1914, when a specimen was taken by Mr. Potter and formed the basis of a short note presented by Swezey to the Hawaiian Entomological Society (see Proc. Haw. Ent. Soc., Vol. 3, No. 2, 1915, p. 71). Since then the species has become more abundant, and in Proceedings of the Hawaiian Entomological Society (Vol. 3, No. 3, Sept., 1916, p. 142) Mant exhibited a number of specimens. The species has never been identified, but it has been assumed that it was introduced. In 1917 (Proc. Haw. Ent. Soc., Vol. 3, p. 288), Bridwell records having found adults of this Chrysidid in nests of *Sceliphron* at Diamond Head, Oahu. To accompany a letter dated June 4, 1921, P. H. Timberlake sent six specimens of this wasp to the United States National Museum for identification and referred to them as follows:

"I also send six specimens of a Chrysidid which was first taken here in 1914, and is now fairly common in Oahu. It has not been taken on the other Islands, although Mr. Swezey saw one on Kauai last summer, but was unable to catch it. It is known to parasitize the common *Sceliphron caementarium*."

It is unfortunate that there are no records which would indicate the native home of this species. At first thought one would think that it had been introduced with its host, but this cannot be the case because there is no Chrysidid of the subgenus *Pentachrysis* known from the native home of *Sceliphron caementarium*. Certain species of Chrysidids * are known to

* Besides those mentioned by Dalla Torre (Catalogue Hymenopterorum vol. 6, 1892) and Kohl (Ann. Naturh. Hofmus. Wien, bd. 32, 1918, p. 167) the following may be added: *Chrysis* (*Hexachrysis*) *durga* Bingham on *Sceliphron intrudens* Smith and *Chrysis* (*Trichrysis*) *tridens* Lepeletier on *Sceliphron caementarium* (Drury).

parasitize species of *Sceliphron,* and as the genus *Sceliphron* is known to occur in all zoological regions and the habits of many of the species are similar, it is fair to assume that if a Chrysidid parasitic on any species of this cosmopolitan genus was introduced into Hawaii it would easily adapt itself to the common species of the Islands.

I have compared the specimens before me with the descriptions of all the species assigned to the subgenus *Pentachrysis,* and am unable to find any description with which they will agree. The new species seems to be closely allied to the African *inops* Gribodo, but the transfrontal carina is much more deeply emarginate than it is in that species.

Chrysis (Pentachrysis) extraniens new species.

Female. Length 9.5 mm. Clypeus shining, with sparse distinct punctures, the apical margin with a deep, broad angulate emargination; frontal basin closely and rather finely punctured; at the sides the punctures are somewhat confluent and the surface is striato-punctate; across the top of the frontal depression there is a low nearly straight transverse ridge and above this a stronger, more complete ridge which is angulately emarginate medianly, and when seen from above appears as a deeply emarginate transfrontal carina; the area between these two carinae polished, impunctate; two irregular, raised lines extending dorsad of the frontal carina and enclosing the anterior ocellus in a large horse-hoof-shaped area; frons above carina and vertex with large, close punctures which are even closer in the postocellar area; posterior orbits with large punctures, the carina strong (less so dorsally) and extending to about the middle of the eye; malar space granular, its length subequal with the width of mandible at base (or length of pedicellum); antenna stout, the third joint subequal in length with four plus five, pronotum with its median length subequal with the medium length of the scutellum, the dorsal and anterior surfaces with large rather close punctures, the two surfaces not sharply separated, dorsally with a median longitudinal depression; pronotum longer laterally, the lateral and dorsal surfaces separated by a sharp carina, sides shining but with large punctures dorsally; scutum shining, with large punctures which are more widely separated than those of the pronotum; notauli straight, well-defined and foveolate; scutellum, postscutellum and middle area of propodeum forming a continuous surface which is covered with large, close (somewhat more widely separated on scutellum) punctures; lateral-dorsal area of propodeum granular basally and punctured apically; upper part of mesepisternum with large, close punctures; sides of propodeum striate; tergites shining, with rather large, well-defined punctures which are separated by a distance at least equal to their diameter; second and third tergites with an indistinct raised line medianly; the third tergite gently concave dorsally,

the subapical pits well defined, eight on each side of median ridge; apical margin of tergite with five triangular teeth of uniform size, the distance between the lateral teeth slightly greater than the distance between an intermediate and median tooth; seen from the side the ventral margin of the third tergite is straight.

Greenish-blue, with a bluish reflection on third tergite, a copperish reflection on sides of second tergite, and a dark purplish spot around ocelli and one covering the median area of the scutum; antennae beyond third joint black; legs entirely green; wings brownish-hyaline; venation black; head, thorax and legs with sparse gray hair.

Paratype females have the blue color of the body more pronounced than in the type and might be called blue-green. The subapical pits may be reduced to fourteen.

Male. Length 6 mm. Agrees well with the above characterization of the female, but the end of the third tergite is more pointed and the apical teeth are lower and more obtuse.

Type-locality.—Honolulu, Oahu, Hawaii.

Allotype-locality.—Black Point, Oahu.

Described from five females and one male collected by P. H. Timberlake. The type female was collected on the laboratory window August 15, 1916. The allotype male was collected September 10, 1916. Three paratype females were collected at Honolulu on May 15, 1918, May 15, 1920, and June 22, 1919. The other female is labeled "Ex Sceliphron cells," "Diamond Head, Oahu, May, 1919."

Type, Allotype and *Paratypes.*—Cat. No. 24,645, U. S. Nat. Mus.

Conditions of Entomological Work in India.

BY K. KUNHI KANNAN,
Government Entomologist, Bangalore, India.

(Presented at the meeting of August 4, 1921.)

The development of Economic Entomology as a branch of Scientific Agriculture is so largely due to the United States, that in countries where its importance was recognized only later there has been a pronounced tendency to adopt methods and results obtained in the States without reference to their suitability to local conditions. India is no exception to the rule. The importance of the investigation of crop pests was recognized only late in the eighties of the last century, but the duty was left in the hands of men who were engaged in Museum work and who were, therefore, not able to investigate the pests reported to them. It was inevitable, therefore, that recommendations were made based on results obtained in the States, and that several of them proved useless. It was not till 1901 when the Department of Agriculture was reorganized and an Agricultural Research Institute established in Pusa, that a full-time officer for the study of pests was appointed. Since then the work has rapidly developed. Two of the Provinces have entomologists of their own, and there is in all the Provinces a staff of subordinate officers. In Mysore, one of the native States, an entomologist was appointed as early as 1908. The Entomological staff in India is still unequal to the immense task before it, but in the next few years a more rapid increase in the staff is likely to take place.

Entomological work in India is largely determined by the local conditions, and these are different from those of most other countries. India is a land of peasant proprietors. The average size of holdings is only four acres against sixty or eighty in the United States, and the yield from an acre represents on an average only what an American farmer would willingly spend in spraying alone. Any costly remedies such as those employed in the States are, therefore, entirely out of question except in regard to crops like coffee and tea, in which the yield per acre is sufficiently high. The consequence is that

the entomologist has to devise methods which are within the very small means of the Indian farmer, and spraying, as a general proposition, cannot be considered at all. Such remedies are being devised, with the increasing recognition on the part of Indian entomologists of the profound difference in Indian conditions from those of most Western Countries. Provided the remedy satisfies the requirements indicated above, the Indian farmer can, as a rule, be easily persuaded to adopt them. Indeed, he himself has not been slow to devise certain ingenious remedies. The insecticidal property of mercury was long known to him, and it was not before it was proved by me * that any entomologist thought of the value of the metal in that connection. So, too, in regard to the storage of pulses he has hit upon devices which stood the test of scientific investigation. The simple method of putting a layer of sand on top of stored pulses, which I have suggested as an effective means of safeguarding them from the Bruchids, was derived from a study of the local methods of storing them.

Fumigation, as a method, is inapplicable to conditions in India, where each farmer stores his own pulses for the year, and where villages are so far apart and have such crude facilities of transport that distribution of the chemical could not be done on any large scale. Nor could the farmer be entrusted with so dangerous a chemical. The different method required of storing pulses in India is an illustration of the lines the entomologist has to proceed in India. The remedies that are now being devised take into account this fundamental fact. In my own State several remedies have been devised which are of a very simple character. The treatment of *Nymphula defunctalis,* an amphibious caterpillar pest of rice, with kerosening the water in the fields, was proved simple and popular. Another serious caterpillar pest which devastates many dry crops of the state is being controlled by the handpicking of the moths, which are conspicuous objects in the bare field, and easily caught and killed by the children of the village. More examples need not be given to show how very different are the lines in which entomological work has to be carried on in

* It has recently come to our notice that in a "Treatise on the Culture of the Pineapple," by William Speechly, published in London in 1821, on pages 321-329, is an account of a method of using quicksilver for the destruction of scale insects on pineapple. [Ed.]

India. If in all work relating to the control of pests in India, regard be had to the attenuated and fragmentary character of the holdings of the farmer and his very small means, often hardly adequate to bare livelihood, there can be no doubt that the diffusion of knowledge of Economic Entomology will be as quick and widespread as in the States.

Notes on Immigrant Coleoptera.

BY D. T. FULLAWAY.

(Presented at the meeting of October 6, 1921.)

It is gratifying to be able to refer by name to a number of beetles which have rested in our insect cabinets for some time unidentified. The determinations which follow have been secured through the kindness of Mr. G. E. Bryant, of the Imperial Bureau of Entomology, to whom examples of the different species were referred for identification. The citation of previous references to the species is made as an additional means of recognition. In several cases the present reference is the first that has been made to the occurrence of the species in Hawaii. Immediately following the list of determinations is an extended list of species which have been known in Hawaii for some time without published notice. The bibliographical references furnished have been gained from Gemminger & Harold's Catalogue of the Coleoptera, Junk's Catalogue of the Coleoptera, Leng's Catalogue of North American Coleoptera and other miscellaneous sources of information, as indicated.

These additions to our knowledge of the local Coleoptera have resulted from a brief study of the literature and collections of the Board of Agriculture and Forestry and the Hawaiian Sugar Planters' Experiment Station.

RECENT DETERMINATIONS.

ANTHRIBIDAE.

? Lawsonia sp.*

vide F. H. 1 (6), p. CXXIV; Pr. H. E. S. 3, p. 273.

First record, April 6, 1916.

Earliest specimen collected by D. B. Langford in May, 1910.

Locality: Honolulu (Oahu).

* Specimens referred by Mr. Bryant to Dr. Karl Jordan, a specialist upon this group of beetles, have been recently identified as a new species belonging to the genus *Exillis*, and will shortly be described and published.

LAMIIDAE.

Sybra alternans Wied.

vide Pr. H. E. S. 3, p. 388; 4, pp. 39, 82.

First record, July 6, 1917.

Collected: Honolulu (Oahu).

S. alternans credited to Eschscholtz *in litt.* (cf. Lacord. Gen. Col. IX, p. 616, 1872) in G. & H. (X, 3104).

No reference to Wied. Locality, Malacca. Bridwell (supra, p. 82) recognized the species in material collected by Williams in the Philippine Islands.

OEDEMERIDAE.

Ananca ? sinensis Gemm.

vide F. H. 1 (6), p. CXXVI.

Earliest specimen collected by Swezey at Puako, Hawaii, May 12, 1905. A second specimen captured by Swezey on steamer at Hilo, Hawaii, May 24, 1915, and another taken by Ehrhorn on wharf in Honolulu, June 6, 1911.

Ananca sinensis Gemm. Coleop. Heft. VI, 1870; *chinensis* Bohem. Res. Eugen. 1858, p. 111 (G. & H. VII, p. 2169).

Locality: Hong Kong.

ANTHICIDAE.

Anthicus floralis L.

Not previously recorded.

Earliest specimen collected by Giffard, December 1, 1907.

Locality: Honolulu (Oahu).

Anthicus floralis L. Fauna Suec. 1761, p. 228; Syst. Nat. ed. 12, p. 681. (G. & H. VII, 2095.)

This catalogue gives a lengthy synonomy and the following distribution: Lombardia, Gallia, Anglia, Italia, Germania, Chili, Am. bor. Junk (Anthicidae, p. 47) adds Erythrea and Leng (p. 163) considers it cosmopolitan.

XYLOPHILIDAE.

Xylophilus sp.

Not previously recorded.

Earliest specimen collected by Swezey, October 17, 1905, on mulberry in Honolulu.

The species has also been taken by Swezey on Hawaii, at Hilo, October 26, 1908, and on Kauai at Lihue, March 31, 1912.

TENEBRIONIDAE.

Platydema subfascia Walker.

vide Pr. H. E. S. 3, p. 14.

Earliest specimen collected by Giffard on Tantalus Mt., back of Honolulu (Oahu), December 26, 1904. This species has also been taken by Terry at Kealia, Kauai, October 21, 1905, and by Swezey on Maui, in Iao Valley, July 29, 1906.

First record, September 4, 1913.

Platydema subfascia Walker Ann. Mag. Nat. Hist. (3) II, 1858, p. 284. (Junk's Cat. Col. Tenebrionidae, p. 377.)

Localities: India, Sunda Islands, S. China, etc.

Blapstinus ? dilatatus Lec.

vide Pr. H. E. S. 3, p. 373.

Earliest specimen collected by Swezey at Waipahu, Oahu, August. 25, 1904. The species has also been taken by Swezey on Hawaii, at Kawaihae, September 5, 1919. First record, March 1, 1917.

Blapstinus dilatatus Lec. Ann. Lyc. N. H. N. Y. V, 1851, p. 146. Cas. Mon., p. 430, t. 4, f. 1. (Junk's Cat. Col. Tenebrionidae III, p. 298.)

Localities: Arizona and Southern California. Cited, also, by Leng (p. 231).

Conibius sp. nr. brunnipes Champ.

Not previously recorded.

Earliest specimen collected by Ehrhorn, August 16, 1917.

Locality: Honolulu (Oahu). ?

Conibius brunnipes Champ. Biol. Centr. Amer. Col. IV, I, 1885, pp. 183, 530, t. 6, f. 12. (Junk's Cat. Col. Tenebrionidae, II, p. 302.)

Locality: Central America. Leng (p. 231) gives locality "Mex. (U. S. ?)"

DERMESTIDAE.

Telopes undulata Motsch.

Not previously recorded.

Earliest specimen collected by Terry, December, 1908.

Locality: Honolulu (Oahu).

Telopes (*Aethriostoma*) *undulata* Motsch. Etud. Ent. 1858, p. 47, t. 1, f. 10. (G. & H., III, IV, p. 917.)

Locality: India Or. Listed also by Junk (Dermestidae, p. 60.)

THROSCIDAE.

Trixagus sp.

vide Pr. H. E. S. 3, p. 289.

First record, October 5, 1916.

Locality: Honolulu (Oahu).

STAPHYLINIDAE.

Osorius rufipes Motsch.

Not previously recorded.

Earliest specimen collected at Olaa, Hawaii (collector's name not given), in April, 1918. The species has also been taken by Fullaway on Oahu, in Honolulu, September 9, 1919.

Osorius rufipes Motsch. Bull. Mosc. 1857, IV, p. 508. (G. & H., I, II, p. 642.)

Locality: India Or.

Lithocharis ochracea Er.

Not previously recorded.

Specimens without date label.

Collected: Honolulu (Oahu).

L. ochracea credited to Gravenhorst in G. & H. (I, II, p. 622) and Leng's Cat. Col. N. A. (p. 103).

Localities: (G. & H.) Taite, Chili, Germania; (Leng) Mich. Eur. & N. A. Fla.

DYTISCIDAE.

Hydrovatus confertus Sharp.

Not previously recorded.

Earliest specimen collected by Terry in Honolulu (Oahu), June 12, 1904. The species has also been taken by Swezey on Hawaii at Olaa, April 19, 1920.

Hydrovatus confertus Sharp, Tr. Dublin Soc. (2) II, p. 329, 1882.

Locality: Siam.

CARABIDAE.

Bembidium sp.

Not previously recorded.

Earliest specimen collected at Honolulu (Oahu). Labeled "Kewalo." By Swezey, July 24, 1913.

The species has also been taken by Swezey on Maui, at Waihee, July 11, 1920.

Perigona nigriceps Dej.

Not previously recorded.

Earliest specimen collected at Honolulu (Oahu). Labeled Pond's Dairy, Kapahulu, ex cattle ordure. By Terry and Swezey, May 15, 1907.

P. nigriceps Dejean Spéc. gén. des Coleop. V, 1831, p. 44 (Leng, p. 64).

Localities given: Southern California, Africa, Asia.

HYDROPHILIDAE.

Cercyon sp.

Not previously recorded.

Earliest specimens collected at Honolulu (Oahu), by Swezey? April, 1910.

TROGOSITIDAE.

Lophacateres pusillus Klug.

Not previously recorded.

Earliest specimens collected by Swezey at Honolulu (Oahu), October 2, 1914, in rice-hulls.

Lophacateres pusillus Klug. Jahrbücher der Insectenkunde, Berlin, 1834, p. 159 (Leng, p. 194).

Localities given: Siam, S. C., Texas.

CLERIDAE.

Thaneroclerus buqueti Lef.

Not previously recorded.

Earliest specimen collected by Swezey at Lihue (Kauai), September 11, 1907.

The species has also been taken by Swezey at Honolulu (Oahu), August 18, 1913, ex rotten board on ground, September 7 and 27, 1914, at light.

Thaneroclerus buqueti Lefebvre. Ann. Fr. 1835, p. 582, t. 16, f. 4. Westw. Introd. I, 1839. (G. & H., V-VII, p. 1739.)

Locality: India Or.

Marshall says: "An introduced insect, being known at present only from India and Ceylon."

ADDITIONAL SPECIES NOT HITHERTO CREDITED TO HAWAII.

CURCULIONIDAE.

Imaliodes pusillus Karsch.

Earliest specimens secured in October, 1906, from seeds of *Saraca indica*. Also reared from seeds of *Castanospermum australe*.

Locality: Honolulu (Oahu).

Imaliodes pusillus Karsch. B. E. Z. XXV, p. 10, pl. 1, fig. 15.

Locality: Marshall Islands.

TENEBRIONIDAE.

Gnathocerus maxillosus Fabr.

Earliest specimen collected by Terry, October 19, 1906.

Locality: Honolulu (Oahu).

Gnathocerus maxillosus Fabr. Syst. El. 1, 1801, p. 155.

Localities: America, Madeira, Canary Islands, S. France. (Junk, Tenebrionidae III, p. 392.)

DERMESTIDAE.

Anthrenus thoracicus Melsh.

Earliest specimen collected by Langford July 7, 1909. *vide* An. Rep. U. S. Exp. Sta. 1904.

Locality: Honolulu (Oahu)?

Anthrenus thoracicus Melsh. Pr. Phila. Acad. Nat. Sci. II, 1844, p. 117.

Locality: Middle and Southern States of the U. S. distinct from *A. scrophulariae* (Blatchley. Col. Indiana, p. 597).

COCCINELLIDAE.

Stethorus vagans Blackburn.

Earliest specimen collected by Austin, August 20, 1904.

Locality: Oahu.

Stethorus vagans Blackburn Tr. R. Soc. S. Australia, XV, p. 248.

Locality: Australia.

Pullus sp.

Earliest specimen collected by Terry at Lihue, Kauai, April, 1905.

This species has also been taken by Swezey on Oahu, at Honolulu, September 13, 1905, and on Hawaii, at Honokaa, August 11, 1915.

LATHRIDIIDAE.

Coninomus constrictus Gyll.

Earliest specimen collected by Swezey in Honolulu, March 11, 1921, on Lantana flowers.

Coninomus (*Latridius*) *constrictus* Hummel Ess. Ent. IV, 1824, p. 13. Gyll. Ins. Spec. IV, 1827, p. 138. Cosmopolitan (G. & H., III, IV, p. 896).

CUCUJIDAE.

Silvanus planatus Germ.

Earliest specimen collected by Terry at Aeia, Oahu, April 2, 1906.

Silvanus planatus Germ. Ins. Spec. Nov. 1824, p. 466.

Locality: Am. Bor. (G. & H. III-IV, p. 879). Possibly female of *bidentatus*. (Blatchley, Col. Ind., p. 562.)

Silvanus bidentatus Fab.

Earliest specimen collected by Swezey in Honolulu, April 11, 1917.

Silvanus bidentatus Fab. Syst. El. I, p. 317 (G. & H. III-IV, p. 879).

Locality: Europe.

STAPHYLINIDAE.

Aleochara puberula Klug.

Earliest specimen collected by Swezey at Waialae, Oahu, July 11, 1913.

Aleochara puberula Klug. Ins. Madag., p. 139.

Locality: Madagascar, Madeira, Gallia. "A true cosmopolitan *Aleochara* of the subg. *Xenochara*, first described from Madagascar, although occurring almost everywhere" (Fenyes in litt.).

Gibbium psylloides (Czemp.).

Earliest specimen collected by Swezey in Honolulu, April 21, 1909.

Gibbium psylloides (Czemp.) Dissertation inauguralis Vienna, 1778, p. 51; *scotias* Fabr. Spec. Ins. 1781, p. 74. Cosmopolitan. Introduced into the U. S. A. (Leng, p. 240).

Note on the Isopod Known as Geoligia Perkinsi Dollfus (Crust.).

BY CHAS. CHILTON,

Professor of Biology, Canterbury College, New Zealand.

(Presented at the meeting of October 6, 1921.)

In the Fauna Hawaiiensis, Vol. 2, p. 525, Monsieur A. Dollfus described, under the name of *Geoligia perkinsi*, a terrestrial Isopod which had been collected at several localities in the islands of Hawaii and Kauai at heights varying from two to four thousand feet above sea level. The genus *Geoligia*, to which he referred the species, had been established by him in the year 1893* for a species found at a height of 1200 metres in the forests at Cumbre de Valencia, Venezuela. He defined the new genus as follows:

"Coxopodites (épimères des auteurs) non distincts. Le reste comme dans le genre *Ligia*. Espèces terrestres."

The new species from Hawaii, which is described in some detail, gave Dollfus an opportunity to revise the characters of the genus, and he points out that the line of separation between the epimera and the segments exists on the segments posterior to the first, but is scarcely distinct. To the generic characters, however, he adds that the branches of the uropods are articulated. Consequently, he redefined the genus as follows:

"Coxopodites (épimères) non ou très-peu distincts. Appendices des uropodes articulés. Le reste, et notamment les parties buccales, comme dans le genre *Ligia*. Espèces terrestres."

The species *Geoligia perkinsi* is described at some length, and it is stated that the pleo-telson has the posterior margin provided with five blunt teeth similar to that of *Ligia exotica* Roux.

Some years ago some terrestrial Isopoda were sent to me from Honolulu and Puuloa in the Hawaiian Islands by the late G. W. Kirkaldy as *Geoligia perkinsi*. On examination, however, they proved definitely to be examples of *Ligia exotica*

* Voyage de M. E. Simon an Venezuela; Isopodes terrestres, Ann. Soc. Entomol. de France, vol. LXII, p. 343.

Roux, a species which is stated by Miss Richardson † to occur at "Honolulu, Hawaii." I have dealt fully with this species in my report on the Isopoda from the shore of Chilka Lake, India (Memoirs Indian Museum, Vol. V, p. 462), and in it have pointed out that in the male the epimera are completely united with the segments in all segments, the junction being indicated only by a faint line, but that in the adult females a suture is fairly distinct on segments 2, 3 and 4, and that there appears to be much variation in the distinctness of the epimera in different species of *Ligia*. It is clear, therefore, that this character alone is not sufficient for the establishment of the genus *Geoligia*, as has been admitted by Dollfus himself in the revised diagnosis. There remains, therefore, only the articulations of the branches of the uropods. This character is, as Dollfus states, very remarkable, and I have beeen anxious, therefore, to get specimens showing it. These I have so far failed to obtain. While in Honolulu, in 1920, I collected some specimens of *Ligia* on the edge of a fresh-water swamp at Honolulu, but these proved to be *Ligia exotica*. From the Bishop Museum, by the kindness of Mr. O. H. Swezey, I got also some specimens labeled "S. E. Koolau Mts., Oahu," collected by J. C. Bridwell. These also proved to be undoubtedly *Ligia exotica*, having the branches of the uropods non-articulated. The height at which these specimens at Koolau mountains were obtained is not stated. Subsequently, Mr. Swezey has sent me other specimens from two places at Waialae, one at a sand bank on the edge of a spring near the seashore, and the other at the edge of a fresh-water lagoon near the seashore. All of these prove to be *Ligia exotica*.

From the great resemblance of *Geoligia perkinsi* in most characters to *Ligia exotica*, and from the fact that I have been unable to obtain any specimens from the Hawaiian Islands with the rami of the uropods articulated, I am inclined to believe that there must be some mistake about this character. In the list of localities and specimens from which *Geoligia perkinsi* were obtained, M. Dollfus mentions only one male with a complete uropod, and Mr. Swezey tells me that there are

† Monograph of Isopods of North America, p. 676.

at present no specimens of *Geoligia perkinsi* in the Bishop Museum with uropoda attached.

If this character is based on a single specimen, as appears to be the case, it seems probable that the articulation of the branch of the uropods was either abnormal or perhaps that the appearance was caused by the very slender rami having been bent at certain points. This is easily possible, and has actually occurred in at least two of my specimens, giving an appearance somewhat like articulations. Dollfus, however, definitely states that the exopod is three-jointed and the endopod six-jointed, and this is shown in his figure. The shape of the terminal segment is, as he says, similar to that of *Ligia exotica,* and the other drawings of the head, antennae, lower lip and mandibles, maxillae and maxillipeds correspond precisely with those of *Ligia exotica. Ligia exotica* is primarily a species of the seashore, but it is known to occur on the edges of fresh-water streams and lagoons at considerable distances from the shore, and there seems to be no reason why it may not reach as high as the localities given for *Geoligia perkinsi.* To test the truth of my suggestion that *Geoligia perkinsi* is the same as *Ligia exotica,* I wish, of course, to get specimens from the same localities as those given for *Geoligia perkinsi,* and I shall be greatly obliged to any naturalist who can assist me in doing so. The specimens at present at my disposal are not sufficient to show to what height *Ligia exotica* extends, but it certainly does live in the Hawaiian Islands on the edge of fresh-water springs and lagoons, as shown by the specimens that I have mentioned above, and presumably those from the S. E. Koolau mountains must have been obtained at some considerable height above the sea level.

The tube labeled *"Geoligia perkinsi,* Puuloa,"‡ which was sent to me by the late G. W. Kirkaldy in 1908, contains seven specimens of which two still have the uropoda complete. These are non-articulate, and the specimens are undoubtedly *Ligia exotica,* quite similar to the other specimens from on and near the seashore.

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‡ The place where these specimens were collected is near the mouth of the channel from Pearl Harbor, Oahu.

In the type species of the genus, *Geoligia simoni* from Venezuela, only the outer branch of the uropod was present, and it is non-articulate. The articulation of the branches of the uropods in *G. perkinsi*, if it really occurs, would, as far as I know, be the only instance in the family and should be supported by stronger evidence than that at present existing, for this appears to be based on a single specimen in which the uropods had possibly been injured.

Addenda: From the facts given above I was quite convinced that *Geoligia perkinsi* Dollfus was identical with *Ligia exotica* Roux, but for complete confirmation of this conclusion it was necessary to prove that *L. exotica* extends to heights above sea level comparable to those recorded for *Geoligia perkinsi*. Through the kindness of Mr. O. H. Swezey this proof is now supplied. I have just received two specimens collected by him at the base of leaves of *Astelia* plants at "Summit Camp," Kauai, at an altitude of 2000 feet. These two specimens are quite the same as those found near the seashore and are certainly *Ligia exotica*. The uropoda are detached from the body, but fortunately two complete uropoda are in the tube and these have the branches uniarticulate and agreeing closely with the description I have given for the Lake Chilka specimens of *Ligia exotica*. Mr. Swezey has also sent me two other specimens from Kauai collected by Mr. J. A. Kusche at an altitude of 4000 feet. These prove to be also *Ligia exotica*, fortunately having two uropods present with the uniarticulate branches usual in that and other species and showing no sign of the articulation described for *Geoligia perkinsi*. These specimens show that *Ligia exotica* occurs as a terrestrial species in the Hawaiian Islands up to an altitude of 4000 feet and confirm my conclusion that *Geoligia perkinsi* is the same species and that the articulation of the branches of the uropods described by Dollfus was based on a damaged specimen. Moreover, this is not the only case where a species of *Ligia* commonly found on or near the seashore extends to considerable altitudes, for in Lord Howe Island *Ligia australiensis*, which is common on the seashore in the eastern parts of Australia, occurs in fresh waters up to a height of 700 feet. Similarly in the Juan Fernandez Islands the shore amphipod *Orchestia chiliensis* is also found at altitudes of 1500 feet; in the Hawaiian Islands *Orchestia platensis* is found from the seashore up to very considerable heights, and numerous other examples of the same kind could be given.

(Dr. Charles Chilton, Canterbury College, June 20, 1922.)

A New Hawaiian Delphacid (Homoptera).

(Presented at the meeting of June 2, 1921.)

BY F. MUIR.

Nothorestias swezeyi sp. n. Figures 1 and 2.

Male. Brachypterous; length, 2.4 mm.; tegmen, 1 mm. Vertex very slightly wider than long, apex round, projecting beyond eyes, base slightly in front of middle of eyes; length of frons twice the width, median carina forking a little beyond the middle; antennae reaching slightly beyond base of clypeus, second segment 1.8 times the length of first. Tegmina short, reaching to posterior margin of third abdominal segment, coriaceous.

Opening of pygofer about as long as wide, round, ventral margin produced into a short, stout, pointed process; anal emargination large, anal angles rounded; armature of diaphragm forming a rounded projection reaching nearly to orifice of diaphragm, shagreen. Anal segment large, anal spines large, bases far apart, curved, diverging, their bases swollen. Genital styles flat, outer margin concave on apical half, convex on basal half, inner margin slightly sinuous, apex truncate, corners slightly produced, outer one more so than inner. Aedeagus flattened

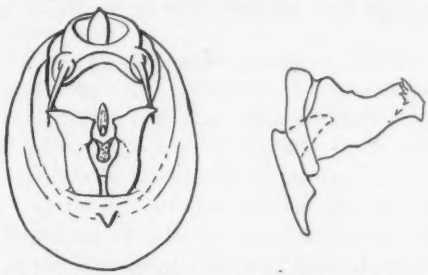


Fig. 1 and 2. Pygofer, full view, and aedeagus, lateral view, left side view, left side of *Nothorestias swezeyi*.

laterally, deep at base, orifice at apex which is slightly turned ventrad, five or six small spines forming a circle near orifice.

Dark brown or nearly black; antennae, legs and dorsal part of apex of abdomen light. Tegmina dark brown, a black mark at apex of clavus.

Female. Brachypterous; length 2.6 mm.; tegmen 1 mm.

Similar in color to male, but the legs are darker.

Described from two males and one female from Makaha, Oahu, 1500 feet elevation, off *Aspidium* sp. (Swezey, March 27, 1921). Type deposited in the H. S. P. A. Collection, No. 1001.

This species comes nearer to *Nesorestias filicicola* Kirk. than it does to *Nothorestias badia* Muir, showing that the condition of the median frontal carina is not a good phylogenetic character.

An Interesting New Derbid Genus (Homoptera).

BY F. MUIR.

(Presented at the meeting of November 3, 1921.)

Anomaladerbe gen. nov.

Tegmina large, broad, surface undulating. Media forking from radius after the basal median sector (M4). Media with three sectors of four, if the small vein at apex be counted. Clavus not distinctly open, but claval vein extending some distance beyond and in intimate connection with cubitus. The second branch of cubitus (Cu 1a) bent and touching Cu 1 for a short distance; Cu 1 also bent and nearly touching M4, which in turn is bent towards M3. The apices of Sc and R thickened considerably. Hind wing half the length of tegmen, anal area well developed with distinct anal veins, margin of anal area corrugated to form stridulating organ. Head produced dorsally, in lateral view conical, flattened laterally. Vertex nearly upright, pointed at apex, excavate; face linear, lateral carinae meeting together from base to near apex; clypeus with two short lateral carinae at base, no median carina; eyes subreniform; antennae large, slightly longer than face, flat, thin with a slightly thickened margin; no subantennal process. Pronotum very short, upright in middle fitting into base of vertex, no shoulder keels. Mesonotum rounded, wider than long, lateral carinae very faint, but each carina produced in middle into a rounded knob.

This genus holds an anomalous position. By the length of the wing it approaches the Zoraidinae, but the presence of a well developed anal area and anal veins prevents it from being placed in the subfamily. In this respect it is like *Symidia* Muir. The clavus is not distinctly open, and so it should be placed in the Cenchreini, but the bending of the cubitus and M4, and the formation of false cross-veins parallel to the margin places it in the Otiocerini. In that tribe it comes next to *Platocera,* but is distinguished from it by the short wings, enlarged apices of subcosta and radius, the greatly elongated head, the two small knobs on the mesonotum and the incom-

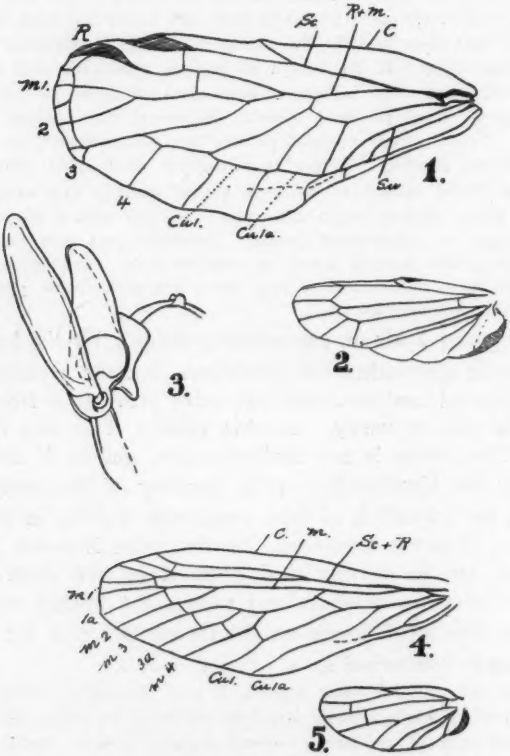
Anomaladerbe pembertoni sp. n. Figures 1, 2, 3.

Female. Length, 2.8 mm.; tegmen, 7 mm. Pregenital plate broader than long, hind margin broadly angularly produced from the sides to the middle, the apex of production curved slightly dorsad. Anal segment broader than long, apex broader than base, truncately sinuate. Yellowish; legs lighter; antennae, head and base of mesothorax tinged with red; basal abdominal tergites red. Tegmina and wings slightly opaque, veins yellow, basally tinged with red; a slight infuscation along the veins in apical half of tegmina.

plete opening of the clavus and the arrangement of the cubitus.

Described from one female from Lami, Viti Levu, Fiji (*C. E. Pemberton,* 1920). Type in H. S. P. Experiment Station collection No. 1002.

The tegmen and wing of *Symidia flava* Muir is figured for the first time. It holds the same position in the Cenchreini as *Anomaladerbe* does in the Otiocerini (figures 4, 5).



EXPLANATION OF FIGURES.

1. Tegmen of *Anomaladerbe pembertoni.*
2. Wing of *Anomaladerbe pembertoni.*
3. Lateral view of head and pronotum of *Anomaladerbe pembertoni.*
4. Tegmen of *Symidia flava.*
5. Wing of *Symidia flava.*

New and Little Known Hawaiian Delphacidae (Homoptera).

BY F. MUIR.

(Presented at the meeting of December 1, 1921.)

The present paper deals chiefly with Delphacidae from the island of Kauai collected by Mr. O. H. Swezey, and a few by Mr. J. A. Kusche. They are of interest, because much less collecting has been done on that island than on the others, and we were unable to state whether the few species known from there indicated a natural paucity or only the limited amount of collecting.

The present collection was over a wide enough area to give us some better idea, and the fact that all the known Kauai species except three, as well as nine species described as new, were taken indicate that it is fairly representative. It consists of nineteen species in all, the Leialoha group with ten, the Aloha group with eight, and one *Kelisia*. An equal amount of collecting in Oahu, Maui or Hawaii would have produced a much larger number of the Aloha group. I think we are justified in considering Kauai as poor in Delphacidae and having a higher proportion of the Leialoha group than the rest of the archipelago.

Mr. Swezey's collections were made at the following elevations: Alakai swamp, 4000 feet; Nualolo, 3000; Kalalau, Kumuwela, Kokee, Halemanu, and Kauaikinana, 3500 feet.

Types deposited in the H. S. P. Experiment Station Collection.

Leialoha Kirk.

The present collection contains some long series of species of this genus, the study of which has decided me to consider as species forms I have described as subspecies. The amount of evolution that has taken place in the Leialoha group is not near so great as in the Aloha group, and the differentiation of the male genitalia has not proceeded so far. We must not, therefore, expect the same amount of specific difference in these organs in the former as in the latter.

Leialoha lehuae Kirk.

Two male specimens from Kokee, Kauai, and one from Alakai swamp (*Swezey*, August, 1921).

Leialoha oceanides (Kirk.). Figure 1.

Aloha oceanides Kirk. Faun. Haw. II, 6, p. 580.

One male specimen that I identify as this species taken on Waialeale Trail, Kauai, elevation four thousand to five thousand feet (*J. A. Kusche,* May, 1920). One male Kalalau, Kauai, off *Osmanthus,* and one female from Alakai swamp (*Swezey,* August, 1921). The aedeagus is thin, cylindrical, very slightly curved, the apex produced into a curved spine; slightly basad of apex. There is a long, curved spine, and still more basad is another much shorter and slightly curved.

Leialoha suttoniae sp. n. Figure 2, 2a.

Male. Macropterous; length, 2.3 mm.; tegmen, 3 mm. Length of vertex equal to width, slightly broadest near apex, apex rounded or bluntly conical, base about middle of eyes. Length of face 1.6 times the width, widest in middle, sides slightly curved, two distinct median carinae. Antennae reaching to base of clypeus, first joint annulate, second three times the length of first.

Opening of pygofer subdiamond shape, wider than long, margins entire, anal emargination large, anal angles large, considerably produced and truncate at apex, surrounding about three-fourths of anal segment. Aedeagus long, cylindrical, thin, slightly curved, apex bent at right angle to form a crook which is fairly straight to near tip, which is curved and acute, with some minute teeth along it; slightly basad of the crook is a small spine.

Vertex and nota black or dark brown, clypeus lighter brown, face, genae, antennae, lateral portions of pronotum, tegulae and legs yellow or very light brown; abdomen dark brown with yellow pleura. Tegmina hyaline, a dark fuscous mark from base to apex over median and cubital area, including the apical radial cells, veins same color as membrane, tubercles small, numerous. Wings fuscous, veins dark.

Female. Macropterous; length, 2.7 mm.; tegmen, 3.5 mm. Similar to males but lighter in color, some specimens being reddish yellow, the fuscous on tegmen very faint and the veins reddish.

Described from five males and thirteen females from Kalalau, Kauai, off *Suttonia sandwicensis* (*Swezey,* August 20, 1921). There are also four males and two females from Nualolo, Kauai, off the same plant, which are all lighter in color with red veins, a dark spot at apex of clavus, and the hind femora and apex of tibiae black or dark fuscous. These specimens are not included in the type material. The nymphs vary in color, becoming darker as they increase in size, the larger

ones having the thorax and wing pads brown or mottled with brown. This species comes near to *L. kauaiensis.* Type No. 1049.

Leialoha scaevolae sp. n. Figure 3.

Male. Macropterous; length, 2.6 mm.; tegmen, 3 mm. Vertex slightly longer than broad, broadest at apex which is rounded or broadly conical. Length of frons nearly twice the width, broadest in middle, sides slightly curved, two distinct median carinae. Antennae reaching slightly beyond base of clypeus, first segment annuliform, second nearly four times the length of first.

Shape of pygofer similar to *L. suttoniae,* but the anal angle not so broadly truncate, more angular; genital styles slightly more acute at apex than in *L. suttoniae.* Aedeagus somewhat similar, but the apex more rounded and the crook at apex thinner, more curved and without teeth, the small subapical spine slightly curved.

Vertex, median portion of pronotum, the mesonotum, dorsum of abdomen and the pygofer dark brown; face, clypeus, antennae, legs, lateral portions of pronotum and ventral surface of thorax and abdomen yellow. Tegmina hyaline, milky white, a small black mark at apex of clavus, the apical cells and the apical margin slightly fuscous, veins and tubercles same color as membrane, tubercles very minute. Wings hyaline, milky white, veins slightly fuscous.

Female. Macropterous; length, 3 mm.; tegmen, 3.6 mm.

Similar to male, but slightly lighter in color; the ovipositor dark brown. Many of the females are uniformly yellow or with a slight infuscation on thorax; the ovipositor is always darker.

Described from thirteen males and thirteen females from Kumuwela, Kauai, off *Scaevola chamissoniana* (*Swezey,* August 28, 1921). There are also two females from Kalalau, Kauai, one off *Osmanthus* and the other off *Coprosma,* neither of which do I consider as food plants. Type No. 1050.

Leialoha kauaiensis Muir.

Two males and one female from Alakai swamp off Ohia lehua; one male from Kalalau off *Suttonia;* one male and two nymphs from Nualolo off Ohia lehua; one male and two females from Kokee off Ohia lehua. The one on *Suttonia* is evidently accidental, Ohia lehua being the food plant.

Nesodryas (Nesothoë) hula (Kirk.). Figure 4.

Six males and two females from Kokee off *Sideroxylon* (*Swezey,* August 28, 1921); six males and five females from Kalalau off *Osmanthus sandwicensis* (*Swezey,* August 20,

1921); one male from Nualolo off *Phyllostegia,* and one female off *Pelea* and two females off *Suttonia.*

These all conform to the original description. The aedeagus has the crook at the apex at about 45°, with its apex expanded and curved.

Nesodryas (Nesothoë) seminigrofrons sp. n. Figure 5.

Male. Macropterous; length, 2.8 mm.; tegmen, 2.9 mm. Vertex distinctly broader than long, apex slightly rounded, produced beyond eyes but slightly, same width as base, base anterior to middle of eyes. Length of face 1.8 times the width, sides slightly curved, median carina slightly obscure at base. Antennae reaching to base of clypeus, first segment as wide as long, second three times the length of first.

Anal angle of pygofer rounded, slightly produced. Genital styles the typical subsickle-shape. Aedeagus tubular, thin, slightly curved and recurved, apex produced into a long, acute process and from its base, on margin of orifice, a T-shape process arises, the cross-piece at apex curved, crescent shape.

Face except apical third, genae except apical half, clypeus and thorax dark brown or nearly black, pronotum with a series of light dots along lateral carinae to behind lateral angles, vertex and frons with light dots, three pairs of dots on face slightly raised and showing signs of forming transverse bands, apical portions of face and genae creamy white; legs light with fuscous marks; first segment of antennae dark, second segment light. Tegmina hyaline slightly stramineous, slightly fuscous at base, an irregular curved fuscous mark from middle of clavus to near base of costa extending irregularly along radial cell to apical, median and cubital cells, a small dark mark at apex of clavus; veins same color as membrane except the apical veins which are dark; tubercles minute, mostly same color as veins, but some on the darker veins of corium are light. Wings hyaline, slightly fuscous, veins dark.

Female. Macropterous; length, 3.3 mm.; tegmen, 3 mm. Similar in color to male.

This species comes next to *N. perkinsi* (Kirk.), the aedeagus of which I figure (Figure 6) for comparison; the apex of the T-piece is much smaller, and the spine at apex shorter and more obtuse.

Described from one male and one female from Kumuwela off *Campylotheca* (*Swezey,* August 28, 1921). Type No. 1052.

Nesodryas (Nesothoë) alboguttata sp. n. Figure 7.

Male. Macropterous; length, 2.2 mm.; tegmen, 2.6 mm. Length of vertex subequal to width, apex broader than base, slightly rounded, base behind middle of eyes; length of face 1.7 times the width, one distinct median carina. Antennae reaching to base of the clypeus, first segment wider than long, second segment more than four times the length of first.

Anal angle of pygofer very slightly produced. Aedeagus thin, cylindrical, apex narrowly rounded with the crook about 45° to stem and slightly expanded at apex, a small spine slightly below apex. Genital styles of the normal subcylindrical shape, characteristic of the genus.

Vertex brown mottled with lighter brown; face brown with three semi-transverse marks and a few small light spots on side, clypeus darker brown. Antennae light brown. Pronotum light brown in middle, darker on sides with small light marks; mesonotum dark brown; legs brown, lighter on hind tibiae. Tegmina hyaline, milky white with brown markings as follows: Extreme base, a broad V-shape mark from costa near base to near apex of clavus and back to costa before stigma, a broad mark from hind margin beyond clavus to apex of radius, the apical veins fuscous, tubercles small, white, bearing white hairs. Wings hyaline, milky white with darker veins.

Described from one male from Kokee off *Antidesma* (*Swezey*, August 19, 1921). This species I consider near to *N. gulicki*, but is distinguishable by tubercles being white instead of brown, the apex of aedeagus is rounded instead of acute, and the shape of the crook is somewhat different. Type No. 1051.

Nesodryas (Nesothoë) semialba sp. n. Figure 8.

Male. Macropterous; length, 2.6 mm.; tegmen, 3.0 mm. Length of vertex subequal to width, apex subequal to base, base about middle of eyes; length of face 1.7 times the width, sides slightly curved, median carina distinct, the lateral carinae curved inward and meet together before the apex of face.

The genitalia are near to those of *N. alboguttata*, but the crook of the aedeagus stouter, the apex broadened out on the inner corner; there is no small spine on the side.

Head and thorax dark brown or black, first segment of antennae brown, second yellow, legs brown, hind tarsi and apex of tibiae lighter. Basal half of tegmina similar to *N. alboguttata* in color, extreme base dark brown, then a narrow light mark, then a broad V-shape mark reaching from costa to hind margin at apex of clavus; the apical half of tegmina milky white; veins same color as membrane, apical veins and apical margin slightly fuscous, tubercles small, same color as veins or slightly darker on apical veins. Wings hyaline, slightly fuscous with darker veins.

Described from one male from Kalalau off *Osmanthus sandwicensis* (*Swezey*, August 20, 1921), and one female from Alakai Swamp (Swezey, August 22, 1921). This species comes next to *N. alboguttata*. Type No. 1057.

Nesodryas (Nesothoë) dodonaeae Muir.

Three males and nine females, and a nymph from Kokee

off *Dodonaea;* one male from Kalalau off *Suttonia;* one male and five females from Halemanu off *Alphitonia* (*Swezey,* August 31, 1921).

One male from Kaholuamano, Kauai, elevation four thousand feet (*J. A. Kusche,* April, 1920).

Aloha swezeyi Muir.

A series of four males and eight females; six from Kumuwela off *Campylotheca;* one from Kokee; four from Nualolo off *Campylotheca;* one from Kauaikinana off *Lipochaeta.* The former figure of the aedeagus * was incorrect, so a more correct one is given herewith (Figure 9).

Ilburnia ipomoeicola (Kirk.).

A long series of both sexes and young off *Lythrum, Polygonum, Pipturus* and *Rumex* from Kokee (*Swezey,* August, 1921).

Ilburnia koae-phyllodii (Muir.).

Three males and one female from Halemanu, and one male and one female from Kumuwela off *Acacia koa* (*Swezey,* August, 1921).

Ilburnia rubescens (Kirk.).

A series from Kaholuamano and Waialae falls, four thousand feet elevation (*Kusche,* April, 1920).

Ilburnia kuschei sp. n. Figure 10.

Male. Brachypterous; length, 2.5 mm.; tegmen, 1.7 mm. Length of vertex about equal to the width at base, apex considerably narrower than base, projecting in front of eyes, straight with median carina of face projecting, base about middle of eyes. Length of face 2.6 times the width, sides very slightly curved, widest on apical half, median carina simple, but the base thickened with an obscure appearance of a fork. Antennae reaching to near middle of clypeus, second segment 2.2 times the length of first. Tegmina reaching to apex of sixth abdominal tergite.

Opening of pygofer a little longer than wide, margins entire, round, anal emargination wide, shallow, anal angles slightly produced, diaphragm fairly long, dorsal margin rounded with a slight indentation in middle, armature standing out as a rounded projection in the middle. Anal segment moderate size, anal spines flattened laterally, median size, broad at base, near together. Genital styles not reaching to anal segment, apex truncate, corners rounded, slightly narrowed in middle, basal angle large, rounded, forming half the inner margin. Aedeagus thin,

* Pro. Haw. Ent. Soc., III, 3 (1916). Plate 2, fig. 21.

subcylindrical, curved slightly dorsad, broadest at base where it is produced on dorsal aspect, a few minute spines about middle.

Ochraceous, black or dark brown between carinae of face, vertex and nota, front and middle coxae dark, some scattered fuscous marks on abdomen. Tegmina hyaline, slightly ochraceous, a dark mark at apex of clavus, veins slightly fuscous in middle, tubercles minute, sparse, bearing black macrotrichia.

Female. Brachypterous; length, 3 mm.; tegmen, 1.9 mm. Lighter in color than the male, the black between carinae of head and thorax much reduced.

Described from two males and two females from near Waialae falls, Kauai, four thousand feet elevation (*J. A. Kusche,* April, 1920). There are also three females and three nymphs, not included in the type series from Kokee, off *Cyrtandra* (*Swezey,* August, 1921), which I consider to belong to this species. This species I place near *I. boehmeriae.* Type No. 1056.

Ilburnia campylothecae sp. n. Figure 11.

Male. Brachypterous; length, 2.1 mm.; tegmen, 1.3 mm. Length of vertex 1.2 times the width, apex projecting beyond eyes, rounded, base about middle, or slightly in front of middle, of eyes; length of face 2.4 times the width, sides slightly curved, median carinae obscurely furcate at base. Antennae reaching slightly beyond base of clypeus, second segment twice the length of the first. Tegmina reaching to posterior margin of seventh abdominal tergite.

Opening of pygofer a little longer than wide, round, margins entire, anal emargination wide, shallow, anal angle rounded, not produced; dorsal margin of diaphragm produced in the middle, the armature running down to the orifice and studded with minute spines. Anal segment on same plan as in *Aloha ipomoeae,* the anal spines large, in full view, strongly diverging to apex, wide at base. Genital styles reaching to anal segment, truncate and broad at apex, inner angle produced, narrowed in middle, anal angle large and quadrate. Aedeagus cylindrical, apex acute, orifice on ventral aspect at apex, five or six spines along ventral aspect, a few on right side and a few on left. Black between carinae of head and pronotum, carinae and antennae light brown or yellow, mesonotum black with the hind apex yellow, coxae black, legs sordid yellow, the femora with a faint longitudinal fuscous mark. Abdomen dark, yellow at base with small light marks on pleura and in the middle on apical tergites, anal segment sordid yellow. Tegmina hyaline, light sordid yellow with a large subtriangular fuscous mark in middle, the base of the triangle is slightly concave and extends along the nodal line from apex of costal cell to apex of clavus, the apex is near base, one side running parallel with Sc + R and the other across to near apex of clavus; veins

same color as membrane, tubercles very sparse, minute and bearing black macrotrichia.

Female. Brachypterous; length, 2.2 mm.; tegmen, 1.5 mm. Similar in structure and color to male, but the mark on tegmina greatly reduced.

Described from two males and one female from Kumuwela from which the holotype and allotype are selected, and two males from Nualolo, which have the mark on tegmina reduced and faint (*Swezey,* August, 1921), off *Campylotheca.* Type No. 1055.

Ilburnia naenae sp. n. Figure 12.

Male. Brachypterous; length, 2.4 mm.; tegmen, 1.8 mm. Length of vertex 1.7 times the width, apex rounded, projecting slightly in front of eyes, base considerably behind the middle of eyes; length of face 2.2 times the width, widest in middle, sides slightly curved, median carina simple or slightly thickened at base, but not furcate. Antennae reaching to near middle of clypeus, second segment double the length of first. Tegmina reaching to base of pygofer.

Opening of pygofer slightly longer than wide, margins entire, rounded, anal emargination large, anal angle not produced. Dorsal margin of diaphragm U-shape with a median armature projecting in middle and continuing to near orifice, the armature with a row of very fine spines on each side. Anal segment medium size, spines flattened laterally, bases well apart. In some specimens the anal spines are more acute than in the one figured. Genital styles reaching to anal segment, flat, apex truncate with the apical corners produced, the inner one more so than the outer, outer margin slightly concave, inner margin concave on apical half, convex on basal half, basal angle obscure. Aedeagus subtubular, slightly flattened laterally, slightly curved, a large, broad-based, flattened spine arises about the middle of the ventral aspect slightly on the right side, the base extending about one-third the length; on the left side there is a small spine and a couple of minute ones on apical dorsal and apical ventral aspect, orifice at apex on ventral aspect.

Prothorax and mesothorax, head between carinae, front and middle coxae black or dark brown. Antennae, carinae of head, legs and hind coxae yellow, abdomen black or dark brown with base and small marks at side, along posterior margin of segments and the anal segment, yellow. Tegmina hyaline with a brown mark at apex of costal cell and another at apex of clavus with a very slight infuscation stretching between them; veins same color as membrane, tubercles sparse, minute, same color as veins, bearing black macrotrichia.

Female. Brachypterous; length, 3.1 mm.; tegmen, 2.4 mm. In color somewhat lighter than male, the carinae of thorax light.

Described from nine males and seven females from Alakai swamp (*Swezey,* August, 1921), off *Dubautia* sp. The native

name of the various species of this plant, as well as of some of the larger *Raillardiae,* is "naenae."

There is considerable variation in color from the darker to the lighter forms in both sexes, in some the dark mark on tegmen is distinct and runs basad along Sc + R. This species I place near *I. geranii.* The aedeagus recalls that of *Nesorestias nimbata.* Type No. 1054.

Ilburnia viridis sp. n. Figures 13, 13a.

Male. Brachypterous; length, 2.1 mm.; tegmen, 1.5 mm. Length of vertex subequal to width, base slightly behind the middle of eyes, apex rounded, produced slightly in front of eyes, carinae obscure; length of frons 1.8 times the width, widest slightly on apical third, median carina obscure. Antennae reaching near to middle of clypeus, second joint double the length of first. Tegmina reaching to base of pygofer.

Pygofer considerably wider than long, ventral margin shallowly and roundly emarginate and thickened; lateral margins round, entire; anal emargination moderate, enclosing slightly more than half the circumference of anal tube, anal angles rounded, not prominent. Diaphragm fairly long, dorsal margin biconcave, the middle produced into a point, the armature forming a thin plate from dorsal margin to orifice, which in lateral view has three or four irregular serrations. Anal segment moderately large, anal spines moderately large, broad, flattened laterally. Genital styles narrow, long, reaching to anal segment, diverging, inner margin sinuate, outer margin concave in middle, apex truncate, basal angle moderately developed. Aedeagus long, slender, subcylindrical, the apical half straight, basal half slightly curved upward, a row of small teeth along the ventral aspect of apical half or two-thirds, and three or four on dorsal aspect in middle, a few small teeth on left side near apex; orifice on left side at apex.

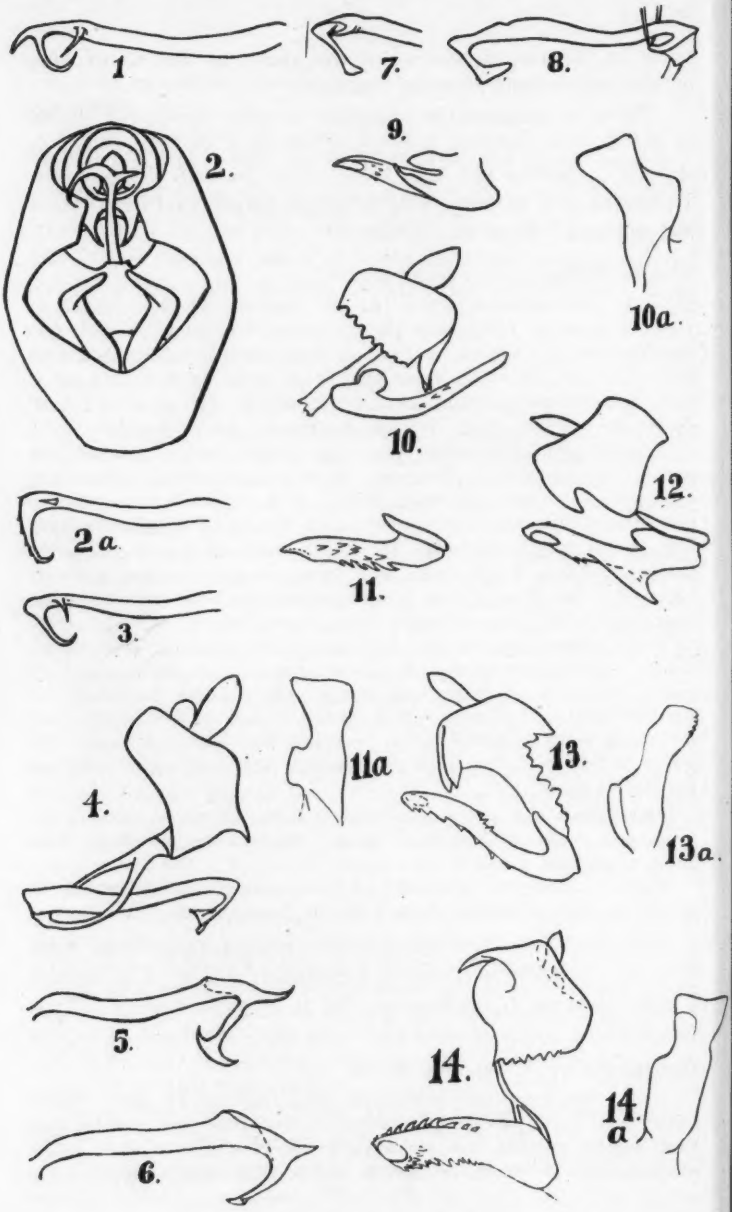
Light green, legs and pygofer slightly lighter in color, arista of antenna and spines on legs dark brown. Tegmina hyaline tinged with green, veins light green.

Female. Brachypterous; length, 2.4 mm.; tegmen, 1.8 mm. Similar in color to male. Ovipositor light brown or fuscous.

Described from two males and thirteen females from Nualolo, off *Phyllostegia* (*Swezey,* September, 1921). This species I place near to *I. boehmeriae,* but it is quite distinct. Type No. 1053.

Ilburnia pilo sp. n. Figures 14, 14a.

Male. Brachypterous; length, 2.1 mm.; tegmen, 1.4 mm. Vertex longer than broad, projecting somewhat beyond eyes, apex broader than base, slightly rounded, base considerably behind middle of eyes; length of frons twice the width, broadest in middle, sides slightly arcuate. An-



Male genitalia of Delphacidae.

tennae reaching to near middle of clypeus, length of second segment nearly twice the first. Tegmina reaching to base of pygofer.

Opening of pygofer longer than broad, margins entire, ventral margin very slightly emarginate; anal emargination large, anal angle angular but not produced; diaphragm fairly long, dorsal margin broadly U-shape, armature forming a broad ridge from dorsal margin to orifice, but not greatly produced, surface slightly shagreen. Anal segment large, spines large, wide apart, their bases greatly enlarged in lateral view, similar to the spines in *Aloha ipomoeicola*. Genital styles reaching to dorsal margin of diaphragm, apex truncate, basal angle not greatly produced, slightly narrowed in middle. Aedeagus subtubular, slightly flattened laterally, very slightly curved; in the dorsal aspect of the apical half there is a row of about ten teeth, on the ventral apical half a row of about two irregular teeth, with a few on the right side.

Dark brown or nearly black, carinae of head and thorax lighter, antennae lighter, legs lighter, coxae and femora fuscous; abdomen dark, with posterior margin light. Tegmina hyaline, slightly fuscous except apical cells and base of clavus, the veins in fuscous area darker, tubercles minute, bearing black macrotrichia.

Female. Brachypterous; length, 2.7 mm.; tegmen, 1.7 mm. Similar in color to the male. Tegmina reaching to base of eighth abdominal tergite.

Macropterous; length, 2.7 mm.; tegmen, 2.6 mm. Similar in color to the brachypterous form; the tegmina hyaline with brown veins and no fuscous mark.

PLATE III.

LIST OF FIGURES.

1. *Leialoha oceanides*, lateral view aedeagus, p. 92.
2. *Leialoha suttoniae*, full view male pygofer; *a*, lateral view aedeagus, p. 92.
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4. *Nesodryas hula*, lateral view of anal segment and aedeagus, p. 93.
5. *Nesodryas seminigrofrons*, lateral view of aedeagus, p. 94.
6. *Nesodryas perkinsi*, lateral view of aedeagus, p. 94.
7. *Nesodryas alboguttata*, lateral view of apex of aedeagus, p. 94.
8. *Nesodryas semialba*, lateral view of aedeagus, p. 95.
9. *Aloha swezeyi*, lateral view of aedeagus, p. 96.
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13. *Ilburnia viridis*, lateral view aedeagus and anal segment; *a*, right style, p. 99.
14. *Ilburnia pilo*, lateral view of aedeagus and anal segment; *a*, right style, p. 99.

Described from twenty-two males, twenty females, and a number of nymphs from Haleakala, 5800 feet elevation, off *Coprosma ernodeoides* (*Timberlake,* July, 1919), the native name of all the species of this genus being "pilo."

This species is near *I. coprosmicola* of Hawaii, but differs distinctly in the genitalia. In *I. coprosmicola* the pygofer is more excavate on the ventral margin and the genital styles more exposed, longer, apex oblique and reaching to the anal segment; the armature of diaphragm is much larger, and projects as a thin flange; the aedeagus is more slender, and the spines not so stout. Type No. 1058.

I. ahinahina n. n.

Ilburnia pulla Muir Pro. Haw. Ent. Soc. IV, p. 98 (1919), pre-occupied by *I. rubescens* var. *pulla* (Muir). Pro. Haw. Ent. Soc. III, p. 186 (1916).

Kelisia swezeyi Kirk.

A small series from Halemanu off *Eragrostis* (*Swezey,* August, 1921).

The Distribution and Island Endemism of Hawaiian Delphacidae (Homoptera) with Additional Lists of Their Food Plants.

BY WALTER M. GIFFARD.

(Presented at the meeting of December 1, 1921.)

In presenting the following tables as a guide and check list to such as may be interested in this group of our endemic leaf-hoppers, the compiler wishes to digress somewhat from the introductory remarks which such tables might ordinarily occasion. Because our endemic leaf-hoppers, like some others elsewhere, do not particularly affect agricultural interests, and therefore are of no special economic importance, some may wonder why so much interest is taken in their biology and morphology by our local entomologists. There are several reasons for this. First, because of several very injurious species of hoppers, not so very far from our gates, which as yet have not reached Hawaii; and, second, because the sugar cane leaf-hopper (*Perkinsiella saccharicida*), which cost this Territory losses of many millions of dollars in 1903, 1904 and subsequent years, is, as it were, the foundation-stone of economic entomology in Hawaii. Not only was this Delphacid responsible for large money losses, but it was also the cause for organizing in 1903 of a large staff of entomologists for biological research and field work in the Territory, and the building up of such organizations as the Experimental Station of the Hawaiian Sugar Planters' Association and the Territorial Board of Agriculture and Forestry and its Plant Quarantine and Inspection Department. It is therefore not surprising that the many families and groups of leaf-hoppers distributed through both continents are of more than passing interest to some of our systematic as well as economic workers. The systematic study of these families or groups, whether local or foreign, is quite necessary because, with Hawaii as the "Cross Roads of the Pacific" and in almost daily steamship communication with many tropical or sub-tropical regions, there is always the possibility that one or more of several known species of hoppers

or other injurious insects may be accidentally introduced. In this connection, as an instance, it might here be recorded that in 1913 Mr. J. C. Bridwell, while in Nigeria, West Africa, collected there among other material for study in Honolulu, a small Delphacid, allied to our own sugar cane leaf-hopper, which Mr. Muir later described as *Megamelus flavolineatus*. During the past year Mr. Muir has received collections of leaf-hoppers from Porto Rico (where insects of some sort are carrying mosaic disease in sugar cane) and among these he found this West African species of which Mr. Wolcott, the entomologist in Porto Rico, remarks: "The identification of *M. flavolineatus* was especially fortunate, as this is a cane insect which may become a serious pest." The fact, therefore, that these insects convey many plant diseases also makes their study necessary for economic work. Knowledge acquired purely from scientific studies sooner or later is the foundation of applied practices, as is well instanced in the "Fauna Hawaiiensis," without which we never could have handled our local entomological problems with the same degree of certainty.

The present tables summarize our knowledge of the distribution of the endemic Delphacidae in our islands and further adds to the lists of their food plants as previously published.* As is to be expected, the species having *all* or many long-winged forms have a wider distribution than those having only a few or *no* long-winged forms. The comparative paucity of *Alohini* on Kauai and comparative richness of *Leialohini* is of interest and may indicate that that island was separated from the others before the arrival of Delphacidae in the Archipelago. The distribution shows the value of segregation in species formation, which fact is also shown by the lists of food plants. Those species living on two or more plants show much greater variability than those confined to a single plant. When we consider the topography of the islands, the isolated distribution of many plants and the fact that so many species are represented only by short-winged forms or by only an occasional long-winged form, we can see how isolation can take place even on the same island.

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* Proc. Haw. Ent. Soc. III, No. 4, May, 1917, p. 339 et seq.

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* The references include only such papers as give descriptions, notes, and observations.

TABLE I.

Island Distribution of Hawaiian Delphacidae *

ALOHINI	Macropterous Form		Brachypterous Form		Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	Bibliography†
	Male	Female	Male	Female							
Leialoha											
naniicola.....(Kirk)	X	X				X				X	(1) p. 580; (3) p. 172
lehuae.....(Kirk)	X	X			X	X		X			(1) p. 581; (3) p. 172; (8) p. 91
oahuensis.....Muir	X	X				X		X			(3) 173; (4) 300
hawaiiensis.....Muir	X	X								X	(3) 173; (4) 300; (5) 409
mauiensis.....Muir	X	X							X		(6) 87; (7) 509
lanaiensis.....Muir	X	X						X			(4) 299
kauaiensis.....Muir	X	X			X						(3) 173; (8) 93
suttoniae.....Muir	X	X			X						(8) 92
scaevolae.....Muir	X	X			X						(8) 93
ohiae.....(Kirk)	X	X			X	X				X	(1) 581; (3) 174
oceanides.....(Kirk)	X	X			X						(1) 580 (Aloha); (3) 174; (8) 92
pacifica.....(Kirk)		X			?		?				(1) 581
Nesodryas											
freycinetiae.....Kirk	X	X				X					(1) 596; (3) 175
giffardi.....Kirk	X	X				X					(1) 597; (3) 175
elaeocarpi.....Kirk	X	X				X					(1) 596; (3) 175
eugeniae.....Kirk	X	X				X		X			(1) 597; (3) 175; (4) 301
antidesmae.....Muir	X	X				X					(4) 300
dodonaeae.....Muir	X	X			X						(3) 176; (8) 95
Nesodryas (Nesothoë)											
fletus.....(Kirk)	X	X						X	X		(1) 592; (3) 176; (4) 302; (6) 87
dryope.....Kirk	X	X			X	X				X	(1) 597; (3) 176; (4) 301; (5) 409
haa.....Muir	X	X								X	(7) 509
munroi.....Muir	X	X						X		X	(4) 303; (6) 87
gulicki.....Muir	X	X				X				X	(3) 177; (4) 301; (6) 87
alboguttata.....Muir	X				X						(8) 94
semialba.....Muir	X	X			X						(8) 95
terryi.....(Kirk)	X	X				X					(1) 594; (4) 301
bobeae.....(Kirk)	X	X				X					(1) 593; (3) 177
piilani.....(Kirk)	X	X					X	X			(1) 594; (3) 178; (4) 301
maculata.....Muir	X	X						X		X	(3) 177; (4) 302; (5) 409
perkinsi.....(Kirk)	X	X				X					(1) 593; (3) 178
seminigrofrons.....Muir	X	X			X						(8) 94
hula.....(Kirk)	X	X			X						(1) 592; (3) 178; (8) 93
laka.....(Kirk)	X	X							X		(1) 594; (3) 178; (6) 87

*Islands showing ? mark opposite three species are included in the summaries and tables of island endemism.

†See page 105 for list of references.

TABLE I—Continued.

ALOHINI	Macropterous Form		Brachypterous Form		Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	Bibliography
	Male	Female	Male	Female							
Nesodryas (Nesothoë)—contd.											
pluvialis.....(Kirk)	.....	X	.....	.....	X	.....	.....	.....	.....	.....	(1) 595; (3) 178
silvestris.....(Kirk)	.....	X	.....	.....	.....	.....	.....	X	.....	.....	(1) 595; (3) 178
frigidula.....(Kirk)	.....	X	.....	.....	.....	.....	.....	.....	.....	X	(1) 593; (3) 178
Aloha											
ipomoeae.....Kirk	.....	X	X	X	X	X	X	X	X	X	(1) 581; (3) 178; (6) 88
myoporicola.....Kirk	.....	.....	X	X	.....	.....	.....	X	.....	X	(1) 581; (3) 179; (4) 303; (5) 410; (7) 510
plectranthi.....Muir	.....	.....	X	X	.....	X	.....	.....	.....	.....	(3) 179
kirkaldyi.....Muir	.....	.....	X	X	.....	X	.....	.....	.....	.....	(3) 180
swezeyi.....Muir	.....	X	X	X	X	X	.....	.....	.....	X	(3) 180; (4) 303; (5) 410; (8) 96
flavocollaris.....Muir	.....	.....	X	X	.....	X	.....	.....	.....	.....	(3) 181
dubautiae.....(Kirk)	.....	.....	X	X	.....	X	.....	.....	.....	.....	(1) 583 (Nesopleias); (3) 182
artemisiae.....(Kirk)	.....	.....	X	X	.....	X	.....	.....	.....	.....	(2a) 118 (Nesopleias); (3) 182
campylothecae.....Muir	.....	.....	X	X	.....	X	.....	.....	.....	.....	(3) 183; (4) 303
Nesorestias											
filicicola.....Kirk	.....	.....	X	X	.....	X	.....	.....	.....	.....	(1) 583
nimbata.....(Kirk)	.....	.....	X	X	.....	X	.....	.....	.....	.....	(1) 582
Nothorestias											
badia.....Muir	.....	.....	X	.....	.....	X	.....	.....	.....	.....	(4) 304
swezeyi.....Muir	.....	.....	X	X	.....	X	.....	.....	.....	.....	(8) 87
Dictyophorodelphax											
mirabilis.....Swezey	.....	.....	X	X	.....	X	.....	.....	.....	.....	(2) 104; (3) 184; (4) 279
swezeyi.....Bridwell	.....	.....	X	X	.....	X	.....	.....	.....	.....	(5) 386
praedicta.....Bridwell	.....	.....	X	X	.....	.....	.....	.....	X	.....	(6) 72
Ilburnia											
koae.....(Kirk)	X	X	X	X	?	X	.....	.....	.....	X	(1) 583; (2) 161, 208 fig.; (3) 185; (5) 410
rubescens.....(Kirk)	X	X	.....	.....	X	X	.....	.....	X	X	(1) 584; (2) 202; (5) 411; (6) 90; (8) 96
rubescens var. pulla.(Muir)	X	X	.....	.....	.....	X	.....	.....	.....	X	(3) 186; (5) 411
koae-phylodii.....(Muir)	X	X	.....	.....	X	?	.....	.....	.....	.....	(3) 186; (8) 96
pilo.....Muir	.....	X	X	X	.....	.....	.....	.....	X	.....	(8) 99
coprosmicola.....Muir	.....	.....	X	X	.....	.....	.....	.....	.....	X	(6) 103; (7) 516
pseudo-rubescens...(Muir)	X	X	.....	.....	.....	.....	.....	.....	X	X	(3) 186; (5) 411; (6) 88
swezeyi.....(Muir)	.....	.....	X	.....	.....	X	.....	.....	.....	.....	(3) 187
anceps.....(Muir)	.....	.....	X	X	.....	.....	.....	.....	.....	X	(3) 187; (5) 411
nephelias.....(Kirk)	.....	.....	X	X	.....	.....	.....	X	.....	.....	(1) 588; (3) 197; (4) 308
nigriceps.....(Muir)	.....	.....	X	X	.....	.....	.....	X	.....	.....	(4) 308
cyrtandricola.....(Muir)	.....	.....	X	X	.....	.....	.....	.....	.....	X	(5) 406, 412
dubautiae.....Muir	.....	.....	X	X	.....	.....	.....	.....	X	.....	(7) 510
pele.....(Kirk)	X	X	.....	.....	.....	.....	.....	.....	.....	X	(1) 585; (3) 188; (4) 304
raillardicola.....Muir	.....	.....	X	X	.....	.....	.....	.....	X	.....	(6) 102

TABLE I—Continued.

ALOHINI	Macropterous Form		Brachypterous Form		Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	Bibliography
	Male	Female	Male	Female							
Ilburnia—continued											
nesopele.....Muir			X	X					X		(7) 511
oahuensis.....(Muir)			X	X		X					(3) 188
stenogynicola.....Muir			X	X					X		(6) 94
campylothecae.....Muir			X	X	X						(8) 97
mamake.....Muir			X	X					X		(6) 101
cyrtandrae.....(Muir)			X						X		(3) 189
timberlakei.....(Muir)			X			X					(4) 304
phyllostegiae.....(Muir)		X	X	X						X	(5) 405, 412
kokolau.....Muir			X	X					X		(6) 95
neocyrtandrae.....Muir			X	X					X		(6) 100
gouldiae.....(Kirk)			X	X		X					(1) 586; (3) 189
nephrolepidis.....(Kirk)			X	X		X				X	(1) 586; (2) 203; (3) 189
blackburni.....(Muir)	X	X	X	X		X			X	X	(3) 189; (4) 308; (5) 411; (6) 108; (7) 514
curvata.....Muir			X						X		(6) 96
aku.....Muir			X	X						X	(7) 513
perkinsi.....(Muir)			X						X		(3) 190
neeogunnerae.....(Muir)			X	X				X			(4) 305
gunnerae.....Muir)			X	X		X					(4) 305
disjuncta.....Muir)			X	X				X			(4) 306
amamau.....Muir			X	X					X		(7) 512
painiu.....Muir			X	X					X		(6) 102
neowailupensis.....Muir			X	X		X					(3) 191 (N. wailupensis); (6) 108
lobeliae.....(Muir)			X	X		X					(3) 212; (4) 306; (6) 108; (7) 520
waikamoiensis.....Muir			X	X					X		(6) 97; (7) 514
wailupensis.....(Muir)			X	X		X					(3) 181 (Aloha)
boehmeriae.....Muir			X	X		X					(7) 514
viridis.....Muir			X	X	X						(8) 99
kuschei.....Muir			X	X	X						(8) 96
pipturi.....(Kirk)			X	X		X	X				(1) 584; (1) 202; (3) 191
chambersi.....(Kirk)			X	X						X	(1) 590; (1) 202; (3) 192; (7) 515
osborni.....(Muir)			X	X					X		(3) 192; (6) 99
acuta.....Muir			X	X					X		(6) 96
geranii.....Muir			X	X					X		(7) 515
naense.....Muir			X	X	X						(8) 98
cyathodis.....(Kirk)			X	X						X	(1) 589; (3) 192; (6) 91
var. fullawayi.....(Muir)			X	X			X				(3) 192; (6) 91
var. lanaiensis.....(Muir)			X	X				X	X		(4) 309; (6) 92
var. nigrinervis.....Muir			X	X					X		(6) 92
var. eeke.....Muir			X	X					X		(6) 92
incommoda.....(Muir)			X	X		X					(3) 193
ahinahina.....Muir			X						X		(6) 98 (pulla); (8)
mauiensis.....Muir			X	X					X		(6) 99
sulcata.....Muir			X	X					X		(7) 516
leahi.....(Kirk)	X	X	X	X	X	X					Ent. 1904 p. 176 (Megamelus) (2) 202; (3) 193

TABLE I—Continued.

ALOHINI	Macropterous Form		Brachypterous Form		Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	Bibliography
	Male	Female	Male	Female							
Ilburnia—continued											
monticola.....(Kirk)	.....	.....	X	X	...	...	...	...	X	...	(1) 591; (3) 197; (6) 90
raillardiae.....(Kirk)	.....	X	X	X	...	...	...	...	...	X	(1) 590; (2) 203; (3) 194; (4) 309; (7) 516
coprosmae.....Muir	.....	.....	X	X	...	...	...	...	X	...	(6) 93
neoraillardiae.....Muir	.....	.....	X	X	...	...	...	...	...	X	(7) 517
ipomoeicola.....(Kirk)	X	X	X	X	X	X	...	...	...	X	(1) 586; (2) 202; (3) 194; (5) 412; (7) 517; (8) 96
longipes.....Muir	.....	.....	X	X	...	...	...	...	X	...	(6) 93
halia.....(Kirk)	.....	.....	X	X	...	X	...	...	...	...	(1) 584; (2) 202; (3) 194
giffardi.....(Muir)	.....	.....	X	X	...	X	...	...	...	...	(3) 194
montis-tantalus.....(Muir)	.....	.....	X	X	...	X	...	...	...	...	(3) 195
sharpi.....(Muir)	.....	.....	X	X	...	X	...	...	...	...	(3) 195
asteliae.....(Muir)	.....	.....	X	X	...	X	...	...	...	...	(4) 307
koebelei.....(Muir)	.....	.....	X	.....	...	X	...	...	...	...	(4) 308
gigantea.....Muir	.....	.....	X	.....	...	X	...	...	...	...	(7) 517
rocki.....(Muir)	.....	.....	X	X	...	X	...	...	...	...	(3) 196
haleakala.....(Kirk)	.....	.....	.....	X	...	...	...	...	X	...	(1) 587; (3) 197
argyroxiphii.....(Kirk)	.....	.....	X	X	...	...	...	...	X	...	(1) 590; (2) 203; (3) 197; (6) 89.
procellaris.....(Kirk)	.....	.....	X	X	...	...	X	...	...	...	(1) 583; (3) 197
umbratica.....(Kirk)	?	?	?	?	...	...	...	...	...	X	(1) 585
hamadryas.....(Kirk)	.....	X	.....	.....	...	X	...	...	...	...	(1) 587
palustris.....(Kirk)	.....	.....	X	.....	...	...	X	...	...	...	(1) 589; (2) 202
nubigena.....(Kirk)	.....	.....	X	.....	...	...	X	...	...	...	(1) 589
imbricola.....(Kirk)	.....	.....	X	.....	...	...	...	...	X	...	(1) 590
sola.....(Muir)	.....	.....	X	.....	...	X	...	...	...	...	(4) 307
hamata.....(Muir)	.....	.....	X	X	...	...	...	X	...	...	(4) 309
tetramolopii.....Muir	.....	.....	X	X	...	...	...	...	X	...	(6) 88
bridwelli.....Muir	.....	.....	X	X	...	...	...	...	X	...	(6) 90
olympica.....Muir	.....	.....	X	X	...	X	...	...	...	...	(7) 520
ulehihi.....Muir	.....	.....	X	X	...	...	...	...	...	X	(6) 104
DELPHACINI											
Kelisia											
sporobolicola.....Kirk	.....	X	X	X	X	X	...	...	X	X	(1) 578; (4) 310; (6) 86; (7) 509
var. immaculata...Muir	.....	.....	X	X	...	...	...	...	...	X	(7) 509
swezeyi.....Kirk	.....	X	X	X	X	X	...	...	...	...	(1) 578; (4) 310; (7) 509; (8) 102
eragrosticola.....Muir	.....	X	X	X	...	...	...	...	X	...	(6) 85
emoloa.....Muir	.....	.....	X	X	...	X	...	...	...	...	(4) 311
‡paludum.....Kirk	.....	.....	X	X	...	X	...	...	...	...	(1) 579; (4) 310
Perkinsiella											
‡saccharicida.....Kirk	X	X	X	X	X	X	X	X	X	X	
Peregrinus											
‡maidis.....(Ashm.)	X	X	X	X	X	X	X	X	X	X	

‡Introduced species.

TABLE I—Continued.

Summary of Genera and Species Described from all Islands

Genera	Species
Leialoha	12
Nesodryas	6
Nesodryas (Nesothoë)	18
Aloha	9
Nesorestias	2
Nothorestias	2
Dictyophorodelphax	3
Ilburnia	87
†Kelisia	6
*Perkinsiella	1
*Peregrinus	1
Total	147

*Recent introduction.

†One species (K. paludum) cosmopolitan.

TABLE II.

Total Species on Each Island

Genera	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii
Leialoha	7	4	1	3	1	3
Nesodryas	1	5	0	1	0	0
Nesodryas (Nesothoë)	6	5	1	5	2	6
Aloha	2	8	1	2	1	3
Nesorestias	0	2	0	0	0	0
Nothorestias	0	2	0	0	0	0
Dictyophorodelphax	0	2	0	0	1	0
Ilburnia	9	30	5	6	35	19
Kelisia	2	4	0	0	2	2
Perkinsiella	1	1	1	1	1	1
Peregrinus	1	1	1	1	1	1
	29	64	10	19	44	35

TABLE III.

Single Island Endemism*

Islands	Leialoha	Alohae	Delphacini	Tota
Kauai	10	4	0	14
Oahu	6	33	2	41
Molokai	0	3	0	3
Lanai	2	5	0	7
Maui	2	31	1	34
Hawaii	3	13	1	17
	23	89	4	116

*The tables of Island Endemism include **Kelisia paludum**, a cosmopolitan species, but not the recent introductions, **Perkinsiella saccharicida** and **Peregrinus maidis**.

TABLE III—Continued.

Species Included in Single Island Endemism

Genera	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	Total
Leialoha	4	0	0	1	1	1	7
Nesodryas	1	4	0	0	0	0	5
Nesodryas (Nesothoë)	5	3	0	1	1	2	12
Aloha	0	6	0	0	0	0	6
Nesorestias	0	2	0	0	0	0	2
Nothorestias	0	2	0	0	0	0	2
Dictyophorodelphax	0	2	0	0	1	0	3
Ilburnia	4	20	3	5	30	13	75
Kelisia	0	2	0	0	1	1	4
	14	41	3	7	34	17	116

Species Included in Two Island Endemism

	Leialoha	Nesodryas	Nesodryas (Nesothoë)	Aloha	Ilburnia	Kelisia	Totals
Kauai + Oahu	0	0	0	0	2	1	3
Kauai + Molokai	1	0	0	0	0	0	1
Oahu + Molokai	0	0	0	0	1	0	1
Oahu + Lanai	1	1	0	0	0	0	2
Oahu + Hawaii	1	0	1	0	2	0	4
Molokai + Lanai	0	0	1	0	0	0	1
Molokai + Maui	0	0	0	0	1	0	1
Lanai + Maui	0	0	1	0	1	0	2
Lanai + Hawaii	0	0	2	1	0	0	3
Maui + Hawaii	0	0	0	1	0	0	1
	3	1	5	2	7	1	19

Species Included in Three Island Endemism

	Leialoha	Aloha	Ilburnia	Total
Kauai + Oahu + Lanai	1	0	0	1
Kauai + Oahu + Hawaii	2	1	2	5
Oahu + Maui + Hawaii	0	0	1	1
	3	1	3	7

Species Included in Four Island Endemism

	Ilburnia	Kelisia	Total
Kauai + Oahu + Maui + Hawaii	1	1	2

Species Included in Six Island Endemism

	Aloha
Kauai + Oahu + Molokai + Lanai + Maui + Hawaii	1

TABLE IV.

*Additions to Reference List of Hawaiian Delphacidae With Their Food Plants.†

Leialoha.

L. oahuensis Muir. *Metrosideros polymorpha* (4) long series, Munro, December, 1916.

L. mauiensis Muir. *Coprosma montana* (6) series both sexes and young, Giffard and Fullaway, May, 1918.

L. lanaiensis Muir. *Metrosideros polymorpha* (4) Munro, November, 1916.

L. kauaiensis Muir. *Metrosideros polymorpha* (3) Swezey, February; (8) Swezey, August, 1921.

L. hawaiiensis Muir. *Metrosideros collina polymorpha* (4) long series, with young, January, 1917.

L. suttoniae Muir. *Suttonia sandwicensis* (8) series both sexes, Swezey, August, 1921.

L. scaevolae Muir. *Scaevola chamissoniana* (8) long series, both sexes, August, 1921.

Nesodryas.

N. giffardi Kirk. *Cyrtandra* sp. (4) *Rollandia grandiflora* (4) Giffard, October, 1917.

N. fletus (Kirk.). *Antidesma platyphyllum* (6) one female, May, 1918, Giffard and Fullaway.

N. gulicki Muir. *Euphorbia* sp. (6) series, Giffard and Muir, December, 1918; *Metrosideros collina polymorpha* var. *glaberrima* (6) large series both sexes, August, 1918, Giffard.

N. perkinsi (Kirk.). *Metrosideros polymorpha* var. (4) small series, Giffard and Fullaway, November, 1916.

N. munroi Muir. *Dodonaea viscosa* var. *spathulata* (6) long series both sexes and young, Giffard, July, 1918.

N. piilani (Kirk.). *Osmanthus sandwicensis* (6) Munro, December, 1916.

N. haa Muir. *Antidesma platyphyllum* (7) large series both sexes, August, 1918; January, September, 1919, Giffard.

N. laka (Kirk.). *Sida* sp. (5) small series both sexes and young, Bridwell, August, 1918.

N. hula (Kirk.). *Sideroxylon* sp. (8) series both sexes, Swezey, August, 1921; *Osmanthus* sp. (8) series both sexes, Swezey, August, 1921.

N. seminigrofrons Muir. *Campylotheca* sp. (8) one female, one male, Swezey, August, 1921.

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* Continued from Proc. Haw. Ent. Soc. III, 4, 1917, p. 339 et seq.

† (*3*) refers to Proc. Haw. Ent. Soc. 1916, III, 3; (*4*) op. cit. 1917, III, 4; (*5*) op. cit. 1918, III, 5; (*6*) op. cit. 1919, IV, 1; (*7*) op. cit. 1921, IV, 3; (*8*) op. cit. 1922, V, 1.

N. alboguttata Muir. *Antidesma* sp. (8) one male, Swezey, August, 1921.

N. semialba Muir. *Osmanthus* sp. (8) one female, one male, Swezey, August, 1921.

N. dodonaeae Muir. *Dodonaea* sp. (8) three males, nine females; *Alphitonia* sp. (8) one male, five females, Swezey, August, 1921.

Aloha.

A. ipomoeae Kirk. *Ipomoea pentaphylla* (6) series both sexes, Giffard and Fullaway, May, 1918.

A. swezeyi Muir. *Cheirodendron gaudichaudii* (5) long series both sexes and nymphs, Giffard, August, 1917; long series both sexes and nymphs off *Bidens pilosa* (5) Giffard, August, 1917; *Campylotheca* sp. (8) series both sexes, Swezey, August, 1921.

Nothorestias.

N. swezeyi Muir. *Aspidium* sp. (8) Swezey, March, 1921.

Dictyophorodelphax.

D. swezeyi Brid. *Euphorbia celastroides* (5) small series, May, 1917; large series both sexes and young, February, 1918, Bridwell and Swezey.

D. praedicta Brid. *Euphorbia hookeri integrifolia* (6) large series both sexes and young, August-September, 1918, Bridwell.

Ilburnia.

I. phyllostegiae (Muir). *Phyllostegia racemosa* (5) long series both sexes and young, Giffard, August, 1917.

I. cyrtandricola (Muir). *Cyrtandra* sp. (5) long series both sexes and young, Giffard, August, 1917.

I. anceps (Muir). *Freycinetia arnotti* (5) four females and four males, Giffard, August, 1917.

I. monticola (Kirk.). *Coprosma montana* (6) long series and young, Bridwell, August, 1918.

I. tetramolopii Muir. *Tetramolopium humile* (6) long series and young, Bridwell, August, 1918.

I. bridwelli Muir. *Argyroxiphium virescens* (6) small series and young, Bridwell, August, 1918.

I. longipes Muir. *Cyrtandra mauiensis* (6) small series both sexes, Giffard and Fullaway, May, 1918.

I. coprosmae Muir. *Coprosma montana* (6) long series both sexes, Giffard and Fullaway, May, 1918.

I. stenogynicola Muir. *Stenogyne kamehamehae* (6) series both sexes, Giffard and Fullaway, May, 1918.

I. kokolau Muir. *Campylotheca* sp. (6) one male, two females, Bridwell, August, 1918.

I. dubautiae Muir. *Dubautia plantaginea* (7) Timberlake, July, 1919.

I. nesopele Muir. *Astelia veratroides* (7) series both sexes, Timberlake, July, 1919.

I. amamau Muir. *Sadleria* sp. (7) very large series both sexes, and young, Timberlake, July, 1919.

I. aku Muir. *Cyanea tritomantha* (7) series both sexes, Giffard, January, 1919.

I. boehmeriae Muir. *Boehmeria* sp. (7) small series and young, Swezey, August, 1919.

I. geranii Muir. *Geranium arboreum* (7) large series both sexes and young, Timberlake, July, 1919.

I. sulcata Muir. *Cyrtandra* sp. (7) small series both sexes and young, Timberlake, July, 1919.

I. blackburni (Muir). *Charpentiera obovata* (5) series both sexes and young, Giffard, August, 1917; *Strongylodon lucidum* (5) series both sexes, Giffard, August, 1917; *Touchardia latifolia* (5) small series both sexes and young (dark form), Giffard, August, 1917; *Cyanea hammatiflora* (6) small series both sexes, Rock, August, 1918; *Clermontia coerulea* (7) series both sexes, Timberlake, August, 1919; *Urera sandwicensis* (7) series both sexes and young, Giffard, August, 1918.

I. neoraillardiae Muir. *Lipochaeta subcordata* (7) very large series both sexes and young, Giffard.

I. gigantea Muir. *Pritchardia* sp. (7) one male only, Swezey, August, 1920.

I. olympica Muir. *Lobelia* sp. (7) small series both sexes, Swezey, August, 1920.

I. chambersi (Kirk.). *Raillardia ciliolata* (7) small series, Giffard, July, 1919.

I. cyathodis var. *lanaiensis* (Muir). *Cyathodes* sp. (6) small series, Bridwell, August, 1918.

I. cyathodis var. *nigrinervis* Muir. *Cyathodes* sp. (6) long series, Bridwell, August, 1918.

I. cyathodis subsp. *ecke* Muir. *Argyroxiphium* sp. (6) long series, Rock, August, 1918.

I. curvata Muir. *Cyrtandra* sp. (6) one female only, Giffard and Fullaway, May, 1918.

I. acuta Muir. *Cyrtandra mauiensis* (6) small series both sexes, Bridwell, August, 1918.

I. waikamoiensis Muir. *Cyanea aculeatiflora* (6) small series and young, Rock, August, 1918; *Cyanea* sp. (7) series both sexes and young, Timberlake, July, 1919.

I. ahinahina Muir. *Argyroxiphium* sp. (6) (8) one male only, Rock, August, 1918.

I. mauiensis Muir. *Campylotheca mauiensis* (6) very long series both sexes and young, Giffard and Fullaway, May, 1918.

I. neocyrtandrae Muir. *Gunnera petaloidea* (6) long series, Rock, August, 1918.

I. mamake Muir. *Pipturus* sp. (6) long series and young, Rock, August, 1918.

I. raillardiicola Muir. *Raillardia menziesii* and *R. platyphylla* (6) long series and young, Bridwell and Swezey, August, 1918.

I. raillardiae (Kirk.). *Raillardia scabra* and *R. ciliolata* (7) long series and young, Giffard, July, 1918.

I. painiu Muir. *Astelia veratroides* (6) small series both sexes, Bridwell, August, 1918.

I. coprosmicola Muir. *Coprosma ernodioides* (6) long series both sexes and young, Giffard, August, 1918.

I. ulehihi Muir. *Smilax sandwicensis* (6) three females and three males, Giffard, August, 1918.

I. nephrolepidis (Kirk.). *Nephrolepis exaltata,** January, August, 1918, January, August, 1919, series both sexes and young, Giffard.

I. ipomoeicola (Kirk.). *Gouldia elongata, Antidesma* sp., and *Cyrtandra* sp. (5) small series with young in instances, Giffard, August, 1917 (probably accidental captures); *Strongylodon lucidum* (5) long series both sexes and young, Giffard, August, 1917; *Mucuna gigantea* (7) series both sexes and young, Giffard, August, 1918; *Polygonum* sp., *Pipturus* sp., and *Rumex* sp. (8) long series both sexes and young, Swezey, August, 1921.

I. lobeliae (Muir). *Kadua glomerata* (6) small series both sexes, Timberlake, September, 1918.

I. viridis Muir. *Phyllostegia* sp. (8) small series both sexes, Swezey, August, 1921.

I. naenae Muir. *Dubautia* sp. (8) series both sexes, Swezey, August, 1921.

I campylothecae Muir. *Campylotheca* sp. (8) small series both sexes, Swezey, August, 1921.

I. kuschei Muir. *Cyrtandra* sp. (8) three females and young, Swezey, August, 1921.

I. koae-phyllodii (Muir). *Acacia koa* (8) small series, Swezey, August, 1921.

I. pilo Muir. *Coprosma ernodioides* (8) very large series both sexes and young, Timberlake, July, 1919.

Kelisia.

K. sporobolicola Kirk. *Eragrostis atropioides* (6) long series, Bridwell, August, 1918; *Eragrostis* sp. (7) one female, one

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* The full series were taken two or three at a time on several occasions on several large plants growing in the *"Algae steam crack"* on the larva flow, within a few hundred yards of the active crater. The heat near steam vents in the crack prevented close collecting. This so-called algae steam crack was since covered by the flow of 1920.

male, Swezey, September, 1920; series, Timberlake, July, 1919.

K. eragrosticola Muir. *Eragrostis variabilis* (6) long series both sexes and young, Giffard and Fullaway, May, 1918.

K. swezeyi Kirk. *Eragrostis* sp. (7) small series, Swezey, September, 1920; *Eragrostis* sp. (8) small series, Swezey, August, 1921.

K. sporobolicola immaculata Muir. *Deschampsia australis* (7) long series both sexes and young, August, September, 1919, Timberlake, Giffard; *Vincentia angustifolia* (7) series both sexes and young (dark var.), Giffard, September, 1919.

Perkinsiella.

* *P. saccharicida* Kirk. (Sugar cane leaf hopper.) Widely distributed on sugar cane since 1902.

Peregrinus.

**P. maidis* (Ashm.). (Corn leaf hopper.) Widely distributed on Indian corn or maize since about 1880.

TABLE V.

ADDITIONS TO ALPHABETICAL LIST ** OF KNOWN HAWAIIAN FOOD-PLANTS † AND OF THE DELPHACIDAE ATTACHED THERETO.

Alphitonia excelsa Reiss. (Kauila). *Nesodryas dodonaeae* Muir.

Antidesma sp. (Hame). *Nesodryas alboguttata* Muir.

Antidesma platyphyllum Mann (Hame or Haa). *Nesodryas fletus* (Kirk.); *Nesodryas haa* Muir.

Argyroxiphium virescens Hbd. (Ahinahina). *Ilburnia bridwelli* Muir.

Argyroxiphium sp. (Ahinahina). *I. cyathodis* subsp. *eeke.* Muir; *I. ahinahina* Muir.

Astelia veratroides Gaud. (Painiu). *I. painiu* Muir.

Bidens pilosa L. *Aloha swezeyi* Muir.

Boehmeria stipularis Wedd. (Akolea). *I boehmeriae* Muir.

Campylotheca mauiensis Hbd. (Kookolau). *I. mauiensis* Muir.

Campylotheca sp. (Kookolau). *I. kokolau* Muir; *Nesodryas seminigrofrons* Muir; *I. campylothecae* Muir.

Charpentiera obovata Gaud. (Papala). *I. blackburni* (Muir).

Cheirodendron gaudichaudii (D. C.) Seem. (Olapa or Kauilamahu) *Aloha swezeyi* Muir.

Clermontia coerulea Hbd. (Haha). *I. blackburni* (Muir).

Coprosma ernodioides Gray (Kukainene) (gen. Pilo). *I. coprosmicola* Muir; *I. pilo* Muir.

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* Accidentally introduced.

** Continued from Proc. Haw. Ent. Soc. III, 4, 1917, p. 345 et seq.

† Specific and native names after Hilbd. Flora Haw. Is. 1888; Rock, Indig. trees of Haw. 1913; Rock, Bot. Bull. No. 2, Bd. Ag. and For. 1913.

Coprosma montana Hbd. (Pilo). *Leialoha lehuae mauiensis* Muir; *I. coprosmae* Muir; *I. monticola* Muir.

Cyanea aculeatiflora Rock (Haha). *I. waikamoiensis* Muir.

Cyanea hammatiflora Rock (Haha). *I. blackburni* (Muir).

Cyanea tritomantha Gray (Aku). *I. aku* Muir.

Cyathodes tameiameiae Cham. (Pukeawe or Maieli). *I. cyathodis* var. *fullawayi* Muir; var. *lanaiensis* Muir; var. *nigrinervis* Muir.

Cyrtandra mauiensis Rock *I. longipes* Muir; *I. acuta* Muir.

Cyrtandra sp. *I. cyrtandricola* Muir; *I. sulcata* Muir; *I. curvata* Muir; *I. kuschei* Muir.

Deschampsia australis Nees. *Kelisia sporobolicola* var. *immaculata* Muir.

Dodonaea viscosa L. var. *spathulata* Sm. (Aalii or Kumakani). *Nesodryas munroi* Muir.

Dodonaea sp. (Aalii). *Nesodryas dodonaeae* Muir.

Dubautia plantaginea Gaud. (Naenae). *I. dubautiae* Muir.

Dubautia sp. (Naenae). *I. naenae* Muir.

Eragrostis variabilis Gaud. (Emoloa or Kalamalo). *Kelisia eragrosticola* Muir.

Eragrostis atropioides Hbd. (Emoloa). *Kelisia sporobolicola* Kirk.

Eragrostis sp. (Emoloa). *K. sporobolicola* Kirk; *K. swezeyi* Kirk.

Euphorbia hookeri integrifolia Hbd. (Akoko). *Dictyophorodelphax praedicta* Brid.

Euphorbia celastroides Boiss. (Akoko). *D. swezeyi* Brid.

Euphorbia sp. (Akoko). *Nesodryas gulicki* Muir.

Freycinetia arnotti Gaud. (Ie-ie). *I. anceps* (Muir).

Geranium arboreum Gray (Nohuanu). *I. geranii* Muir.

Gunnera petaloidea Gaud. (Apeape). *I. neocyrtandrae* Muir.

Ipomoea pentaphylla Jacq. (Kuahulu). *Aloha ipomoeae* Kirk.

Kadua glomerata Hook & Arn. (Pilo? or Au?) *I. lobeliae* Muir.

Lipochaeta subcordata Gray (Nehe). *I. neoraillardiae* Muir.

Lobelia sp. *I. olympica* Muir.

Metrosideros polymorpha Gaud. vars. (Ohia lehua). *L. lehuae mauiensis* Muir; *L. lehuae lanaiensis* Muir; *L. lehuae kauaiensis* Muir; *L. lehuae oahuensis* Muir; *Nesodryas perkinsi* (Kirk.).

Mucuna gigantea D. C. (Kaëë). *I. ipomoeicola* (Kirk.).

Nephrolepis exaltata Schott. (Okupukupu, Nianian or Pamoho). *I. nephrolepedis* (Kirk.).

Osmanthus sandwicensis (Gray) Knobl. (Pua or Ulupua). *Nesodryas piilani* (Kirk.); *Nesodryas hula* (Kirk.); *Nesodryas semialba* Muir.

Pelea sp. (Alani). *Nesodryas hula* (Kirk.) (one specimen only).

Phyllostegia sp. (Ulihi). *I. viridis* Muir; *N. hula* (Kirk.) (one specimen only).

Phyllostegia racemosa Benth. (Kiponapona). *I. phyllostegiae* Muir.

Pipturus albidus Gray (Mamake). *I. mamake* Muir; *I. ipomoeicola* (Kirk.).

Polygonum sp. (Kamole). *I. ipomoeicola* (Kirk).

Pritchardia sp. (Loulu and Hawane). *I. gigantea* Muir.

Raillardia ciliolata D. C. (Kupaua?). *I. chambersi* (Kirk.); *I. raillardiae* (Kirk.).
Raillardia menziesii Gray (Kupaua?). *I. raillardiicola* Muir.
Raillardia platyphylla Gray (Kupaua?). *I. raillardiicola* Muir.
Raillardia scabra D. C. (Kupaua). *I. raillardiae* (Kirk.).
Rumex sp. (Pawale or Uhauhako). *I. ipomoeicola* (Kirk.).
Sadleria sp. (Amaumau). *I. amamau* Muir.
Saccharum officinarum L. (Ko) Sugar Cane. *Perkinsiella saccharicida* Kirk.
Scaevola chamissoniana Gaud. (Naupaka). *Leialoha scaevolae* Muir.
Sesbania tomentosa Hook & Arn. (Ohai). *Aloha ipomoeae* (Kirk.).
Sida sp. (Ilima). *Nesodryas laka* (Kirk.).
Sideroxylon sp. (Alaa, Aulu or Kaulu). *Nesodryas hula* (Kirk.).
Smilax sandwicensis Kth. (Uhi, Ulehihi & Pioi). *I ulehihi* Muir.
Stenogyne kamehamehae Waw. (Puaainaka, Maohiohi or Mohihi). *I stenogynicola* Muir.
Strongylodon lucidum Seem. (Nukuiwi or Kaiwi). *I. blackburni* (Muir); *I. ipomoeicola* (Kirk.).
Suttonia sp. (Kolea). *N. hula* (Kirk.) (two specimens only); *N. dodonaeae* Muir (one specimen only).
Suttonia sandwicensis (A. D. C.) Mez. (Kolea laulii). *Leialoha suttoniae* Muir.
Tetramolopium humile Hbd. *I. tetramolopii* Muir.
Touchardia latifolia Gaud. (Oloná). *I. blackburni* (Muir).
Urera sandvicensis Wedd. (Opuhe). *I. blackburni* (Muir).
Vincentia angustifolia Gaud. *Kelisia sporobolicola immaculata* Muir.
Zea mays L. (Maize or Indian Corn). *Peregrinus maidis* (Ashm.).

Notes and Observations on Parandra Puncticeps Sharp (Coleoptera).

BY W. M. GIFFARD.

(Presented at the meeting of October 6, 1921.)

In July, 1921, the writer found in the dense, inside forest above the "twenty-nine mile" region in Olaa, Hawaii, at approximately 3800 feet elevation, a particularly rotted stump of *Suttonia,* which had been attacked by this Cerambycid. Due to its decayed condition and the absence of all bark, adult beetles were not seen, but a large number of the larvae and pupae were taken. The most part of these were preserved in alcohol for future study, but a number of the pupae were kept alive to be reared, and were later placed in a glass jar filled with the dry but rotted tree loam from the stump. By the end of August, eighteen adults (nine males and nine

females) had been reared from these pupae. In order to make a partial test of the longevity of the adult beetle, the last six specimens reared were kept under observation for four weeks, and later killed. This period could have been extended, as the beetles continued to exhibit considerable activity when emerging from the soil after dark. Their tendency during the night was to fight and mutilate each other, however, and it was deemed necessary to either kill them or have them ruined for specimens. During the period of observation, it was noticed that the beetles appeared above the coarse loam in the jar only after dark, and retired from one to two inches below immediately at or before dawn. During their activity at night, efforts were repeatedly made to keep them under closer observation, using for this purpose the ordinary 40-watt electric lamp in ordinary household use. On every occasion, however, within three minutes of their exposure to light, the whole six specimens had "dug in" and would not reappear until after the jar had again been placed in the dark. Because of these nocturnal tendencies it was not possible to observe whether copulation took place during the period of their captivity. Most probably not, due to the unnatural conditions of their close confinement and to the exceptional activity previously referred to.

A series of fifty-three specimens of this indigenous Cerambycid (including the eighteen examples reared above) collected on the Islands of Hawaii, Kauai, and Oahu, at elevations from 1500 to 4000 feet, have been studied and the genital organs dissected out by the writer from three males and one female from Kauai, two males and one female from Hawaii, and one male from Oahu. Although these dissections may, for the present, be considered as a preliminary study, still, so far as can be seen at this time, the variations noticed by comparison of the genitalia of the examples from each of the islands named, present nothing of real specific value. The same may be said more positively of the body characters. Although the mandibles and the lateral margins of the thorax are extremely variable in male examples from each island, there are intermediate forms which connect these extremes. This is quite noticeable both as to structure and sculpture in the eighteen reared specimens from Hawaii previously referred to. The

smaller series taken "in situ" on Oahu and Kauai present the same tendencies. The representative collections of this Cerambycid have heretofore been very sparse in individual specimens, and in consequence many of the variations noticed from time to time have led some to suspect the possibility of more than the one species described. Examination and study of a series like the present one, however, tends to lessen any such suspicion unless some other important but constant character than is yet known can be found by further study of larger series from all the islands in the archipelago.

The males of this beetle are easily separated from the females by the difference in structure of the mandibles and in the shape of the fifth abdominal ventral segment, which in the male is well rounded, while in the female it is flattened. Among fourteen specimens recently collected on Kauai by Mr. O. H. Swezey was found a small but starved example, the mandibles of which indicated the female sex, while the fifth ventral segment of the abdomen was that of a male. Upon dissection of the genitalia it was found to be a male, as suspected. This tends to show that in this variable species the use of the ventral segment, when separating the sexes, is perhaps more reliable than the mandibles.

While collecting the Kauai specimens above referred to, Mr. Swezey informs me that he observed the eggs of *Parandra puncticeps* inserted into the hard outer surface of the wood of a koa trunk, where the bark had loosened from the tree but had not yet fallen away, there being space enough beneath the bark for the female to perform the process of oviposition. He brought samples of these eggs "in situ" to Honolulu. This is believed to be the first record of finding the eggs of this interesting Cerambycid.

ANNUAL ADDRESS

Observations on the Phenomena of Heredity in the Ladybeetle, Coelophora Inaequalis (Fabricius).

BY P. H. TIMBERLAKE.

(Presented at the meeting of December 1, 1921.)

It has long been known that certain species of ladybeetles of the family Coccinellidae exhibit marked colorational dimorphism or even polymorphism. Among North American species *Adalia bipunctata* (Linnaeus) and *Olla abdominalis* (Say) are known to have a predominantly black phase besides the much more abundant paler form. Mr. A. F. Burgess appears to have been the first American entomologist to make observations on the phases of Coccinellidae, and in some breeding experiments that he conducted with *Adalia bipunctata* found that the black and normal phases, when mated together, produced both phases again not only in the first, but in the second generation.*

In experiments carried on at Whittier, California, in 1912, and again in 1915 at Salt Lake City, Utah (using beetles, however, from Brownsville, Texas, collected by Mr. M. M. High), I found a similar set of phenomena in regard to the heredity of the black and normal phases of *Olla abdominalis*. Throughout the experiments a perfect segregation of the phases was obtained, but there were no other evidences of Mendelian inheritance in respect to the dominance of one phase over the other, or in the sequence and proportions of the phases when interbred. It even seemed next to impossible to get pure stock of the black phase by breeding, for when this phase was mated together for two or more successive generations, the offspring was quite as apt to belong to the normal as to the black phase.

In 1912, I had the opportunity of experimenting with an Oriental Coccinellid *Cheilomenes sex-maculata* (Fabricius), which was brought by Mr. R. S. Woglum from India to the United States. Of this species I received originally eight females and one male which were all of the normal *sex-maculata* phase. As soon as they began to lay eggs the females

Proc. Haw. Ent. Soc., V, No. 1, October, 1922.

* U. S. Dept. Agric. Bur. Ent. Bull. 17, pp. 59, 60, 1898.

were isolated, and the offspring of each were thus kept under observation. Much to my surprise one of the females produced offspring of three types, the normal phase like the parent, a red phase with only the inner margin of the elytra black, and a black phase with a red cross-band behind the humeral angle of the elytra. I experimented with these forms as much as the time at my disposal and the ill-effect of inbreeding would permit, but could discover no evidence of Mendelian inheritance except in the perfect segregation of the phases. A complete set of data obtained from these experiments with *Cheilomenes* was submitted to a well-known student of Mendelian inheritance, Dr. John Detlefsen of the University of Illinois, and he was unwilling to venture any explanation of the phenomena presented, although loath to admit that the inheritance was not amenable to Mendelian laws.

Having seen from my own experiments and from those of other workers, including Mr. A. F. Burgess, Professor R. A. Johnson, and Miss Miriam Palmer, that while the inheritance of ladybeetles is often segregative, its phenomena are not otherwise easily amenable to Mendelian interpretations, I was surprised and delighted to find a case of simple Mendelian inheritance in the Australian ladybeetle, *Coelophora inaequalis* (Fabricius). This inheritance was coupled, moreover, with an example of a segregative but apparently non-Mendelian inheritance in an illuminating manner.

Coelophora inaequalis, so well known to Hawaiian entomologists, was an early introduction of Albert Koebele's into these islands from Australia. As found here it exhibits a remarkable uniformity of markings, and shows no trace of the range of variation credited to it elsewhere† and, in fact, it represents the normal and most abundant of the three phases

† The geographical range of this species is reported to extend from Japan and the Philippines through the East Indian Islands to New Caledonia and Queensland, but I am convinced that the Philippine form really represents a similar but quite distinct species from the Australian. The fact that there are two species confused under this name only partially explains the reputed variability of *inaequalis*, as I have reason to believe that both have a similar range of variation, and that similar color phases are common to both.

that I shall discuss later. It is bright red in color, with heavy black markings on the elytra and with the pronotum mostly black except on the anterior margin (Figure 1).

In July, 1919, Dr. F. X. Williams, on returning to Honolulu from Queensland, brought back a few beetles of *Coelophora inae-*

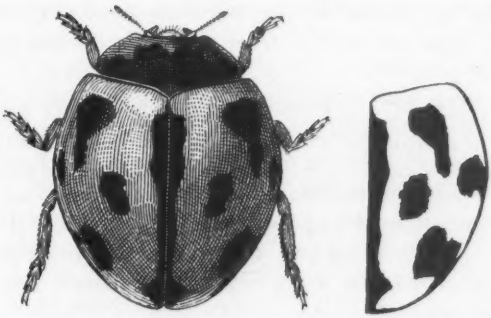

Fig. 1. Normal phase of *Coelophora inaequalis.*

qualis, which furnished the original stock of beetles with which I experimented during the greater part of the following year. In this stock was included two forms, and a third soon appeared in breeding, which to the uninitiated eye appeared to repre-

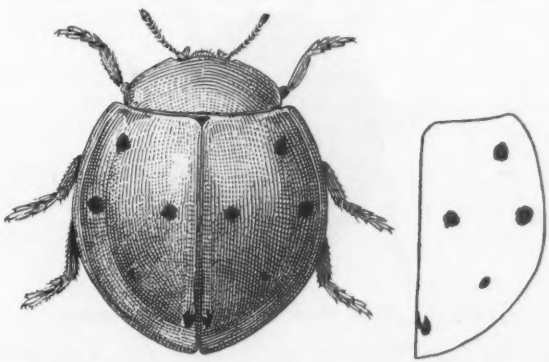

Fig. 2. Eight-spotted phase of *Coelophoria inaequalis.*

sent three distinct species, but which by their behavior and ultimately by their heredity were shown to be but one species.

Besides the normal phase of *inaequalis* there was a paler red form with four round black dots arranged in an oblique-sided quadrangle on each elytron, a common dot on the elytra near their apex, and usually two similar dots near the middle of the pronotum. This form, represented in Figure 2, may be called the nine-spotted phase from the nine dots on the elytra. The dots vary a little in size, but there has been observed no tendency whatever for this form to intergrade with the normal phase.

The third form was solidly black with only the anterior corners of the pronotum red, and I shall refer to it as the black phase (Fig. 3). It was the rarest from at first, although later obtained in number. It apparently was not included among the original lot of beetles which came from the Herbert River, Queensland, but two specimens were reared in the first generation from the stock supply of beetles, and thus of unknown parentage.

My first experiments were directed towards finding out the behavior of the nine-spotted and normal phases towards each other in heredity. Consequently, on August 26, three nine-spotted females were isolated in vials, and a record kept sep-

Fig. 3. Black phase of *Coelophora inaequalis*.

arately for each beetle of the number and character of the offspring which were reared to maturity. These beetles were from the stock supply, and had mated repeatedly and indiscriminately after the manner of Coccinellidae. The number of

offspring reared in these and later experiments may appear trivially small, but this is due to the exacting nature of their voracious appetite and the time and care that has to be bestowed upon each larva to bring it to maturity.

Heredity of the Nine-spotted Phase.

The offspring obtained from the three nine-spotted females were as follows:

Female	Offspring reared
No. 1. Male parentage composite	4 nine-spotted and 15 normal
No. 2. Male parentage composite	9 nine-spotted and 15 normal
No. 3. Male parentage composite	20 nine-spotted and 20 normal
Totals	33 nine-spotted and 50 normal

The breeding together of the nine-spotted offspring gave the following results in the next generation:

Pair	Parent of female	Parent of male	Offspring reared
No. 6	No. 1	No. 3	10 nine-spotted and 6 normal
No. 7	No. 3	No. 2	16 nine-spotted and 3 normal
No. 9	No. 1	No. 2	6 nine-spotted and 1 normal
No. 10	No. 2	No. 3	10 nine-spotted and 2 normal
	Totals		42 12

The nine-spotted offspring of the second generation were again mated together, and gave these results:

Pair	Parent of female	Parent of male	Offspring reared
No. 12	No. 7	No. 6	13 nine-spotted and 0 normal
No. 18	No. 6	No. 10	12 nine-spotted and 5 normal
	Totals		25 nine-spotted and 5 normal

The results of similar matings for the succeeding generation were as follows:

Pair	Parent of female	Parent of male	Offspring reared
No. 21	No. 12	No. 18	0 nine-spotted and 2 normal
No. 27	No. 18	No. 12	8 nine-spotted and 5 normal
	Totals		8 nine-spotted and 7 normal

It thus appears that into the fourth generation the nine-spotted phase, when bred in a direct line, still produced normal

offspring, and, in fact, produced a larger proportion of normal beetles in the fourth than in the third generation. This, however, may have been at least partly due to the smaller number of offspring of the fourth generation reared to maturity. It is possible, but we will not say how probable, if the breeding of this phase in a direct line had been continued longer, that ultimately the production of a practically pure race would have been reached.

Heredity of the Normal Phase.

No attempt was made to breed the normal phase in the direct line, as we already know that this phase was introduced into the Hawaiian Islands years ago, and that it has bred true to itself here since that time. The heredity of beetles of the normal phase derived from the nine-spotted form, however, may be considered.

Pair No. 8 of normal beetles were reared from the nine-spotted females No. 1 and 2, the character of whose offspring we have already seen. From this pair were reared eleven normal offspring.

Both beetles of the normal pair No. 24 were reared from the nine-spotted pair No. 18, and hence the parentage had been nine-spotted for three preceding generations in the female line, and at least for two generations in the male line of descent. From this pair seven normal beetles were reared.

Although these experiments are not extensive enough to be conclusive they seem to indicate that the normal phase is more stable than the nine-spotted phase. Presumably, however, the production of the nine-spotted phase from such parentage is possible, and at least occasionally takes place, although more rarely than the production of the normal phase from nine-spotted parentage.

Heredity of the Normal Crossed With the Nine-spotted Phase.

One mating was made to determine whether either the normal or nine-spotted phase were dominant over the other in heredity. Pair No. 31 consisted of a female of the nine-spotted phase reared from pair No. 12 and a normal male of Hawaiian stock. From the account already given of the heredity of the

nine-spotted phase it is apparent that pair No. 12 were the nearest approach to a pure race of their kind achieved during the course of the experiments, as their offspring, thirteen in number, were all nine-spotted, and we already know that the Hawaiian beetles are at least presumptively of pure normal stock. The offspring of this interesting pair were seven nine-spotted and eight normal beetles.

There is thus no evidence to show that either the normal or the nine-spotted phase is dominant over the other in heredity, and the results of the various matings are not easily interpreted according to Mendelian laws. It is apparent, however, that the normal phase is considerably more stable than the nine-spotted form, as would be naturally expected from its much greater abundance. That the nine-spotted phase is able to maintain itself when it is both less stable and much less numerous than the normal phase is quite likely due to some other factor of heredity intervening which has not been considered as yet. Otherwise, it would seem inevitable that the nine-spotted phase would be finally swamped and eliminated.

Heredity of the Black Phase.

The black phase was not represented in the original lot of beetles that reached Honolulu alive, but two specimens appeared about September 1st in the first generation of offspring emerging in the jar in which the mixed lot of nine-spotted and normal beetles were kept. These were left in the breeding jar for a few days after reaching sexual maturity, and mated indiscriminately with each other and the other beetles. On September 12 one of the black beetles was removed and isolated in a vial as female No. 5, and for a mate was given a normal male of Hawaiian stock. But the fact that this female had mated previously with both the black and nine-spotted phases was apparent from the character of its offspring, as 3 black, 3 nine-spotted, and 16 normal beetles were reared from its eggs. Subsequently the offspring of female No. 5 were bred through five generations, and the black phase was found to be recessive to both the normal and nine-spotted forms and recurring in alternate generations in true Mendelian proportions.

Heredity of the Black Crossed With the Nine-spotted Phase.

In considering these breeding experiments in detail let us first take up the results of the crosses of the black with the nine-spotted phase. Pairs No. 16 and 17 consisted of black females reared from female No. 5 mated with nine-spotted males reared respectively from the nine-spotted pairs Nos. 6 and 9. From female No. 16, 6 nine-spotted beetles, and from female No. 17, 19 beetles of the same form were reared without either normal or black offspring. The reciprocal cross No. 35 had similar ancestry, the female having been reared from the nine-spotted pair No. 27, the black male from the F_2 generation of female No. 17. This crossing gave twenty-three nine-spotted beetles.‡ We see, therefore, that the nine-spotted phase is dominant over the black.

If the cross of black and nine-spotted forms is truly Mendelian in inheritance, as indicated by the dominance of the nine-spotted form over the black, the mating together of the nine-spotted offspring of this cross should produce in the following generation both nine-spotted and black forms in the proportion of 3 to 1. Consequently, three matings were made of the offspring of pairs No. 16 and 17, numbered respectively 19, 20, and 22. The results are conveniently given in tabular form.

Pair No.	Female from	Male from	Phase of parents	Character of offspring
19	No. 17	No. 17	Nine-spotted	15 nine-spotted, 5 black
20	No. 17	No. 17	Nine-spotted	3 nine-spotted, 2 black
22	No. 17	No. 17	Nine-spotted	4 nine-spotted, 1 black
	Totals			22 nine-spotted, 8 black

We see, therefore, that the black phase reappeared in F_2 generation approximately in the correct Mendelian proportion.

‡ Towards the end of this breeding experiment one normal and one black beetle issued from two lots of larvae reared to maturity, but there is considerable probability that these had gotten mixed in by mistake. If large numbers of larvae are handled at the same time, a small percentage of mixture of the different lots must be expected to occur occasionally, even if great care is taken to prevent this mishap.

The assumption follows that the nine-spotted and black phases behave as a simple allelomorphic pair.

Heredity of the Black Crossed With the Normal Phase.

The inheritance of the black crossed with the normal phase was next studied. A black female reared from pair No. 19 was mated with a normal male of Hawaiian stock as pair No. 33. From this mating nineteen normal beetles were reared and no black offspring, thus showing that the normal phase is dominant over the black. A reciprocal cross No. 34 was also made, using a normal female reared from pair No. 27 (parents and grandparents for three generations being nine-spotted) and a black male from pair No. 20. This mating produced twenty-six normal offspring, and thus also showed complete dominance of the normal phase.

The normal offspring of these two crosses were next mated together and the following results were obtained:

Pair No.	Female from	Male from	Phase of parents	Character of offspring
38	No. 33	No. 34	Normal	22 normal, 7 black
39	No. 33	No. 34	Normal	36 normal, 9 black
	Totals			58 normal, 16 black

We thus find an approximate Mendelian proportion of the black offspring to the more numerous normal beetles, and the conclusion is forced upon us that the black and normal phases form a simple allelomorphic pair quite the same as the black and nine-spotted phase. It would seem better, however, to consider the normal and nine-spotted phases taken together as forming one unit of the allelomorphic pair, and the black phase as the other unit.

The Heterozygous Normal Phase.

In the F_2 generation of crosses between the black and normal phases about three-fourths of the offspring are normal, of which one-fourth should be pure normal and one-half heterozygous or carrying both the black and normal factors of inheritance. During the course of my experiments I discov-

ered that the heterozygous normal beetles differ slightly in coloration from the homozygous normals, and that they could be distinguished without fail. The homozygous beetles have the black of the pronotum extending out at the base clear to the lateral margins, whereas in the heterozygous beetles the pronotum is pale at the sides, and the femora and underparts of the thorax are paler (Fig. 4). Pair No. 42 of these normal

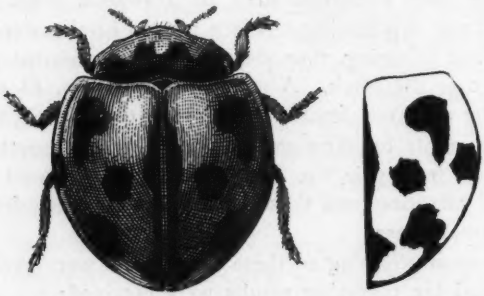

Fig. 4. Heterozygous normal phase of *Coelophora inaequalis*.

but heterozygous beetles selected from the offspring of pairs No. 38 and 39 produced 60 offspring of the F_2 generation; of these 47 were normal and 13 belonged to the black phase. On the other hand, no difference was detected between the homozygous nine-spotted beetles and those of the same phase which are heterozygous for black.

Heredity of Heterozygous Normal and Nine-spotted Beetles in Crosses.

If normal and nine-spotted beetles which are heterozygous for black are mated together we would expect to find segregation of all three phases in the offspring, and that the normal and nine-spotted taken together, outnumber the black offspring about 3 to 1. We would also expect the nine-spotted and normal phases to be produced in about equal numbers, or possibly with a preponderance in favor of the normal as the more stable phase. A cross of this kind was actually made, and we consequently are able to consider the outcome as expressed in the character of the offspring.

The female of pair No. 37 was a heterozygous nine-spotted beetle raised from pair No. 35 (nine-spotted X black), and the

male a heterozygous normal beetle from pair No. 34 (normal X black). A total of 59 beetles were raised from this pair, of which 14 were normal, 28 nine-spotted, and 17 black. The blacks were produced, therefore, in true Mendelian proportion, but there was an unexpected preponderance of the nine-spotted over the normal.

If the ancestry of pair No. 37 be examined, the nine-spotted phase will be found greatly in the ascendency, the direct female line of descent having been nine-spotted for five preceding generations, and the direct male line also nine-spotted for the first four generations. This, perhaps, is the true explanation of the predominance of the nine-spotted phase in the offspring of this pair.

Nine-spotted Phase More Stable When Crossed With the Black.

But, on the other hand, when the nine-spotted phase is crossed with the black, as in pairs Nos. 16, 17 and 35, and in pairs Nos. 19, 20, and 22 of the F_2 generation, the nine-spotted phase is evidently stabilized, as from these pairs as many as seventy nine-spotted offspring were reared without the appearance of the normal phase except in one instance which may have been due to a mixture of lots. In crosses between heterozygous, and presumably homozygous nine-spotted beetles, a large percentage of the offspring were nine-spotted. The data on these crosses may be conveniently tabulated:

Pair No.	Female from		Male from		Character of parents		Character of offspring	
15	No. 10	9-spotted	No. 5	black X normal	9-spotted	7	9-spotted	4 normal
23	No. 17	black X 9-spotted	No. 18	black X 9-spotted	9-spotted	14	9-spotted	1 normal
26	No. 18	9-spotted	No. 16	black X 9-spotted	9-spotted	2	9-spotted	0 normal
28	No. 12	9-spotted	No. 16	black X 9-spotted	9-spotted	19	9-spotted	6 normal
29	No. 15	9-spotted	No. 17	black X 9-spotted	9-spotted	14	9-spotted	4 normal
36	No. 22	9-spotted	No. 23	9-spotted	9-spotted	19	9-spotted	4 normal
		Totals				75	9-spotted	19 normal

There is some evidence, therefore, that the nine-spotted phase is given greater stability when crossed with the black,

and this may be the explanation of the preponderance of the nine-spotted phase in the offspring of pair No. 37. We have also already seen that in crosses between the nine-spotted and the normal phase there is a distinct tendency for the former to be gradually eliminated, as it is less stable than the normal. If it is true that the nine-spotted phase is constantly stabilized by crosses with the black, the one tendency counteracts the other, and the nine-spotted phase is thus able to maintain itself under natural conditions.

Heredity of Heterozygous Beetles Crossed With Black.

In crosses where one parent is recessive and the other heterozygous, the offspring should be produced in the ratio of one recessive to every dominant. Two crosses of this nature were made and produced results given here in tabular form:

Pair No.	Female from	Male from	Character of parents	Character of offspring	
40	No. 35	No. 20	Heterozygous 9-spotted female X black male	33 black	35 9-spotted
41	No. 34	No. 20	Heterozygous normal female X black male	26 black	29 normal

We thus observe that the expected proportion of the phases was nearly perfectly attained in the offspring.

Heredity of the Black Phase Crossed With Black.

As the last link in the chain of evidence to prove that the black phase is a simple Mendelian recessive, the cross was made of black with black, using a female reared from pair No. 38, and a male from pair No. 39. From this union (pair No. 43) were reared a total of sixty-two beetles, all of which were black like the parents, showing that the black phase breeds true to itself as a recessive should.

Conclusions.

From the data now presented to you it is evident that the black phase of *Coclophora inaequalis* is a Mendelian recessive to the dominant normal and nine-spotted phases, that it breeds true to itself, and when crossed with either of the dominant forms is produced in Mendelian proportions in alternate generations.

The relationship of the normal and nine-spotted phases is

difficult of Mendelian interpretation, although they are perfectly segregative in inheritance. On the whole the evidence in this species and in other species of Coccinellidae with corresponding forms, would indicate that the inheritance of these forms is not Mendelian and that the laws governing its manifestations are not yet discovered or understood. Taken together, however, the normal and nine-spotted phases form one unit of the allelomorphic pair of which the black phase is the other unit.

Descriptions of New Genera and Species of Hawaiian Encyrtidae (Hymenoptera), III.

BY P. H. TIMBERLAKE.

(Presented at the meeting of December 1, 1921.)

The present paper completes the consideration of Hawaiian Encyrtidae so far accumulated, except the endemic species of *Anagyrus*. The genera here treated all belong to the Mirini and the new species are apparently endemic. The types have been deposited in the collection of the Hawaiian Entomological Society.

Coelopencyrtus Timberlake.

The discovery of a fourth species of this interesting genus seems to indicate that our knowledge of its extent is far from complete. Of the described species three have been reared from *Odynerus nigripennis* (Holmgren) and only one from all the other species of *Odynerus*, although Dr. Perkins has recorded one or two probably undescribed species from the larvae of *Odynerus montanus* Smith and *O. oahuensis* Dalla Torre.* The preponderance of material reared from *nigripennis* is probably due to the fact that the nests of this species are much more frequently found than those of any other species of *Odynerus*, which are perhaps just as frequently parasitized.

The females of *Coelopencyrtus* are not easily distinguished as a rule, whereas the males show good characters in the structure of the head and antennae. The following table of the species may be found useful, although no characters have been discovered which will distinguish the females of *odyneri* and *swezeyi* in all cases. The distinctions given for these two species apply only to specimens from Oahu, as specimens of *swezeyi* from Hawaii have the characters given for *odyneri*, except that the eyes are considerably more sparsely pubescent than in specimens of either species from Oahu.

FEMALES.

1. Head not greatly wider than long, if at all; the frontovertex nearly thrice as long as wide; the eyes distinctly pubescent..... 2

Proc. Haw. Ent. Soc., V, No. 1, October, 1922.

* Fauna Hawaiiensis, Introduction, Vol. I, part 6, p. xcvii, 1913.

Head considerably wider than long; the frontovertex much wider or about twice as long as wide; the eyes bare.....*orbi* Timb.

2. Head about as long as wide; the clypeal margin produced medially; middle tibiae yellowish brown, except towards the base..... 3

Head somewhat wider than long, the clypeal margin roundingly arcuate, not distinctly produced medially; middle tibiae wholly blackish; frontovertex narrowest in front of the anterior ocellus. *mauiensis* n. sp.

3. Clypeal margin abruptly produced medially into a broadly rounded process; frontovertex narrowest at a point about halfway between the anterior and posterior ocelli, and strongly bluish in color. *odyneri* Timb.

Clypeal process less abruptly produced and somewhat subangulate at apex; frontovertex narrowest at the anterior ocellus and with a more or less greenish luster.....*swezeyi* Timb.

MALES.

1. Frontovertex either distinctly longer than wide or considerably produced in front of the eyes..... 3

Frontovertex no longer than wide and only slightly produced in front of the eyes..... 2

2. Frontovertex a little wider than long, the frons weakly protuberant; pedicel of antennae with a basal conical process above. *orbi* Timb.

Frontovertex as long as wide, the frons rather strongly protuberant; pedicel expanded on dorsal side at apex so that it is twice as wide at apex as at base.....*mauiensis* n. sp.

3. Anterior ocellus on a line with the anterior margin of eyes in dorsal view of head; pedicel no wider than long; the first funicle joint with a lamelliform process above at base.....*odyneri* Timb.

Anterior ocellus in front of a line connecting the anterior corners of the eyes in dorsal view of head; pedicel considerably wider than long; the first funicle joint patelliform, produced above as a thin plate and as a short ramus on the outer side; the second funicle joint produced into a short ramus on the outer side. *swezeyi* Timb.

Coelopencyrtus sp.

A single female reared from the mud cell of *Odynerus oahuensis* Dalla Torre, collected at Makua, Oahu, in 1900 by Messrs. Koebele and Perkins, seems to represent a new species, but in the absence of the male it would be inadvisable to formally name and describe it. In the above table of species it would run to *odyneri*, except that the frontovertex is proportionately wider, being hardly over twice as long as wide. The

head is somewhat thinner fronto-occipitally than in *odyneri,* a little wider than long, and the eyes appear to be somewhat more densely pubescent. The coloration agrees very well with *odyneri.*

Coelopencyrtus mauiensis n. sp. Figures 1-3.

Female. Similar to *odyneri,* but the head is somewhat thicker fronto-occipitally, and a little wider than long, with the clypeal margin subtruncate and rounding towards the sides, the medial process practically absent; frontovertex narrower, being narrowest at a point a little in front of the anterior ocellus, the inner orbits of the eyes, therefore, somewhat diverging posteriorly throughout a greater part of their length; ocelli in an equilateral triangle with the anterior ocellus somewhat behind the center of the frontovertex. (In specimens of *odyneri* of about the same size as the types of *mauiensis* the frontovertex is noticeably wider and the ocellar triangle is larger but still equilateral as the anterior ocellus is placed farther forward either at or before the center of the frontovertex, whereas in much larger specimens of *odyneri* the ocellar triangle is noticeably still more acute.) In other structural details and in sculpture and vestiture practically as in *odyneri.*

Coloration also about the same, except in regard to the legs and wings; the former are nearly wholly blackish, with the front and hind tarsi brownish, the middle tarsi and tibial spur brownish yellow, the middle tibiae also more or less brownish yellow, narrowly at apex on the under side; wings hyaline, with the smoky stain found in *odyneri* fainter,

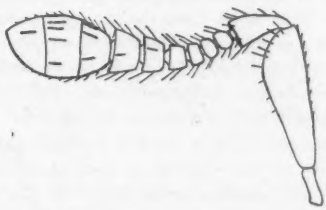

Fig. 1. *Coelopencyrtus mauiensis.* Antenna of female.

except across the disc opposite the apical third of the venation and abruptly terminating in a straight line parallel with the speculum and somewhat more basal, the base of the wing being perfectly clear except for a short, smoky streak near the posterior margin.

Length of body, (0.91 to) 1.21; length of head, 0.419; width of head, 0.466; width of vertex at posterior ocelli, 0.117; width of mesoscutum, 0.417; length of forewing, 1.00; width of forewing, 0.440 mm.

Male. Similar to *odyneri* in general characters, but the head is only twice as thick dorsally as at the oral margin, less distinctly longer than wide, and more rounded in frontal view but not so distinctly so as in

orbi; frontovertex as long as wide and only slightly produced in front of the eyes with the frons nevertheless rather strongly protuberant; ocelli in a right-angled triangle, the anterior ocellus placed just behind a line connecting the anterior corners of the eyes, the posterior pair situated about one-half more than their own diameter from the occipital margin. Scape as wide as in *odyneri* and shaped nearly as in *swezeyi* and *orbi*, with the dorsal margin even more deeply concave and the ventral margin evenly and strongly convex, the inner margin near the base provided with a minute nipple-like process; pedicel comparatively large, flattened

Fig. 2. *Coelopencyrtus mauiensis.* Antenna of male, lateral view.

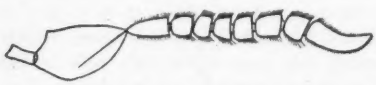

Fig. 3. *Coelopencyrtus mauiensis.* Antenna of male, dorsal view.

and produced above at apex so that in lateral view it is much wider at apex than at base and wider than either the scape or club; first and fifth funicle joints subequal in length and somewhat longer than the other joints, the second and third shortest; in lateral view of the funicle, all the joints more or less transverse, the first joint much wider at apex than at base and a little wider than the three following joints, but somewhat narrower than the fifth, the sixth distinctly smaller than the fifth, but appearing somewhat thicker in dorsal view; club somewhat shorter than the last three funicle joints combined, distinctly wider than the funicle and strongly obliquely inclined as in *odyneri.*

Face above antennae with a median carina, which reaches upward almost to the middle of the eyes; whole face above antennae shagreened or without smooth and polished areas found in the males of the other three species, being finely reticulate on the upper part between the eyes and rugulose-reticulate below, more roughly in the lower part of the scrobal impression or just above the strong transverse protuberance below and partly between the antennal sockets, considerably more smoothly in the deepest parts of the scrobal impressions opposite the upper half of the median carina; area of differentiated sculpture on either side of face between the antennal sockets and the eyes is very finely lineolate-reticulate and sharply defined below from the rugulose area of the middle of the face, but intergrading above next to the eyes with the reticulations of the upper part of the face, this area also much smaller than in *odyneri* or *swezeyi* and leaving a much wider median interspace; frontovertex duller or with the reticulations more rugulose than in *odyneri.*

Sculpture otherwise not differing materially from *odyneri*, and similar to the female.

The suberect pubescence on frontovertex and upper part of face rather dense and long, or about as in *odyneri;* the tuft of fine pubescence on the pedicel confined to the apex on the dorso-anterior margin; the short, erect pubescence of eyes rather dense as in *odyneri.*

Coloration as in the female except that the antennae are somewhat more brownish.

Length of body, (1.09 to) 1.19; length of head, 0.487; width of head, 0.471; width of vertex at posterior ocelli, 0.223; width of mesoscutum, 0.450; length of forewing, 0.992; width of forewing, 0.447 mm.

Described from 76 females, 7 males (holotype, allotype and paratypes), reared July 22, 1920, from a larva of *Odynerus nigripennis* (Holmgren), collected on the ditch trail near Keanae, Maui (O. H. Swezey).

Nesencyrtus kaalae (Ashmead). Figures 4, 5.

This species seems to have been unusually common in the fall of 1919 and following winter, as large series were reared at that time from the larvae or pupae of *Nesoprosopis fuscipennis* (Smith) and a small species which was probably *N. koae* Perkins, collected in the mountains back of Honolulu by Messrs. Bridwell and Williams.

From a pupa of what was probably *Nesoprosopis koae,* col-

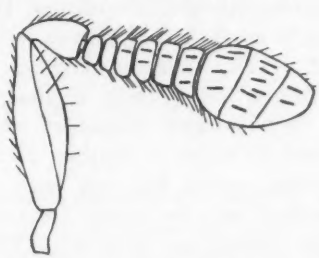

Fig. 4. *Nesencyrtus kaalae.* Antenna of female.

lected by Mr. J. C. Bridwell in a rotten stump at the base of the Thurston trail, Nuuanu Valley, Oahu, on October 19, 1919, 1 male and 17 females issued on November 1-2, and 5 living females were also taken in the debris of the same stump.

From three larvae of *Nesoprosopis* collected in a living condition by Mr. Bridwell from the same stump, and later exposed

by me to the parasites, there issued from the first, after it had pupated, 60 males and 25 females on November 15-16; from the second 1 male and 17 females on November 15-16; and

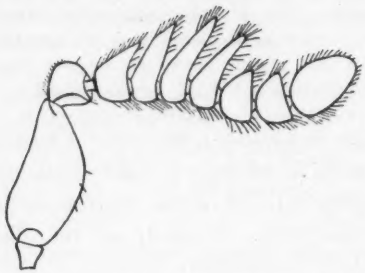

Fig. 5. *Nesencyrtus kaalae*. Antenna of male.

from the third 1 male and 45 females about November 24. Presumably, these were already parasitized when exposed to the parasites from October 25 to November 7. The parasitized pupa above noted was so closely packed with the pupation cells of the parasite that even the front femora were utilized.

From a parasitized larva of *Nesoprosopis fuscipennis* collected by Dr. F. X. Williams December 14, 1919, on the Manoa Cliff trail, Oahu, there issued 62 females on December 26.

From the larva of a small *Nesoprosopis* sp. possibly *N. koae* Perkins, collected by Dr. Williams, January 4, 1920, on the waterfalls ridge, Manoa Valley, Oahu, at about 1600 feet elevation, and which did not show parasitism when found, there issued 16 males and 10 males on January 27-29.

The Oahu males, which had not been seen previously, proved to be identical with the males from Kilauea, Hawaii, described in these Proceedings, Vol. 4, p. 223. The Kilauea females, however, have the head somewhat thinner fronto-occipitally and the frontovertex proportionately wider or about one-half longer again than wide instead of about twice as long as wide as in the Oahu specimens. The frontovertex is also deeper blue, but the coloration does not differ materially otherwise.

Nesencyrtus sp.

One female collected at a steam crack near Kilauea, Hawaii,

3800 feet elevation, September 6, 1919 (W. M. Giffard), is apparently a new species, but it would be inadvisable to name it at this time as the males in this genus show better distinguishing characters than the females. It differs from Kilauea specimens of *kaalae* in having a slightly different shaped head and longer ovipositor and paler legs. The apex of the front and hind tibiae, the middle tibiae, and all the tarsi except the apical joint are brownish yellow, whereas only the tarsi and apical half of the middle tibiae are pale in *kaalae*.

Nesencyrtus sexramosus n. sp. Figure 6.

Male. Head somewhat thinner fronto-occipitally and of different shape than in the male of *kaalae;* as seen from above it is very strongly transverse or about three times wider than long, the anterior margin almost straight, the sides rounded, the occipital margin concave; as seen from the side it is only slightly thicker fronto-occipitally above than at the oral margin, the occipital margin appearing convex and the face concave above the antennal sockets; as seen from in front it is slightly wider than long and has roughly the shape of a keystone, being well rounded above, and with the sides converging from about the middle of the eyes nearly in a straight line to the broad oral margin; occiput somewhat concave; eyes small, very broadly ovate, only slightly longer than wide; frontovertex about a half wider again than long, its anterior

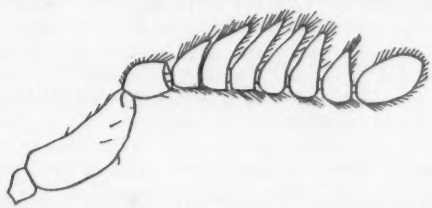

Fig. 6. *Nesencyrtus sexramosus.* Antenna of male.

margin not produced in front of the eyes; ocelli considerably smaller than in *kaalae* and arranged in an obtuse-angled triangle, the anterior ocellus about its own diameter from the anterior margin of the frons, the posterior pair about one-half their own diameter from the eye margins and three times as far from the occipital margin; cheeks longer than wide and somewhat longer than the eyes; face broad, convex below the antennal sockets and rather deeply concave above them to form a large scrobal impression.

Antennae inserted far apart a short distance from the oral margin, of similar structure as in *kaalae*, but the scape is not twisted and in side view is rather strongly concave above and convex on the ventral margin,

and as seen from above considerably thickened at base; pedicel a little longer than wide, not produced on inner side as in *kaalae;* funicle joints all ramose on the inner side, the branches of the two middle joints longest, those of the first and sixth joints shortest, the sixth joint being similar to the fifth joint of *kaalae;* club a little longer and narrower than in *kaalae.*

Scrobal impression finely lineolate-reticulate and somewhat more coarsely and evidently sculptured than the frontovertex, the fine lines more or less concentric around a pair of small triangular more deeply impressed smooth areas placed on either side of the short median carina on lower half of the impression, this carina not expanding above as in *kaalae.*

In other characters of form, sculpture and pubescence not materially different from *kaalae.*

General color moderately shiny black, the face below antennae and the frontovertex bluish black, the axillae and scutellum slightly bluish, the scrobal impression and mesoscutum with a dark greenish luster; antennae blackish, the scape and pedicel shining, the flagellum dull and more brownish; legs black with a luster like that of the body, but all the tarsi and the spur of the middle tibiae brownish yellow, with the apical joint of the tarsi more or less infuscated; wings hyaline, the veins dark brown.

Length of body, 1.13; length of head, 0.438; width of head, 0.483; thickness of head, 0.221; width of vertex at posterior ocelli, 0.228; width of mesoscutum, 0.438; length of forewing, 1.11; width of forewing, 0.499 mm.

Described from one male (holotype) collected in the Kau desert, near Kilauea, Hawaii, at 3800 feet elevation, September 13, 1919 (W. M. Giffard).

Hypergonatopus n. g.

Female. Head subhemispherical, with the face moderately inflexed; eyes rather large and the frontovertex moderately to strongly narrow, ranging from about two and one-half to six times longer than wide, the vertex with a distinct small fovea in each posterior corner; the ocelli arranged in a more or less acute-angled triangle, the posterior pair close to the eye-margin and more or less removed from the occipital margin; face with a broadly ovate or subcircular shallow scrobal impression, divided longitudinally by the broad, low protuberance between the antennae. Antennae inserted far apart close to the clypeal margin; the sockets more than twice their own length apart; scape slender, reaching considerably beyond the scrobal impression; pedicel obconical, about as long as the first three funicle joints combined; flagellum moderately clavate, the funicle joints short, mostly about as long as wide or a little

transverse and increasing gradually in thickness distad; club three-jointed, rather large, about as long as the funicle and obliquely truncate at apex. Mandibles narrow at apex with three more or less unequal acute teeth, the inner tooth smallest and the middle longest, sometimes con-

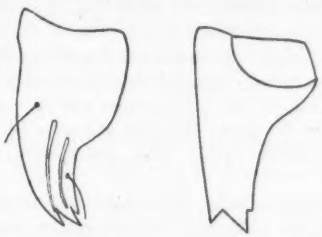

Fig. 7. *Hypergonatopus hawaiiensis.* Mandible of female, interior and dorso-anterior views.

siderably longer than the other two; base of mandible broad and expanded nearly in the same plane with apex. Palpi short, the maxillary pair four-jointed, the two middle joints about as long as thick, the basal joint one and one-half to two times as long, the apical joint about three times as long; labial pair with three nearly equal joints, each about as long as thick.

Thorax of about the usual size and robustness, the mesoscutum strongly transverse, twice or more wider than long; axillae short and transverse, meeting or nearly meeting at their inner tips; scutellum longer than wide, rounded at apex, and more or less longer than the scutum; propodeum short and declivous, but lengthening towards the sides, the spiracles minute and circular. Abdomen ovate, depressed or often more or less deeply sunken in behind the first tergite, nearly as wide at base as the thorax and about one-half to two-thirds as long; ovipositor not protruded and enclosed to the apex of the abdomen by the ventrites.

Legs normal, the middle tibiae enlarging towards apex, the middle tarsi stout at base but tapering towards apex, the spur as long as the first tarsal joint. Wings either of the hemipterous type or fully developed; in either case the marginal vein is elongate or usually about three or four times as long as the rather short stigmal vein, the postmarginal somewhat shorter than the stigmal or sometimes a little longer in the hemipterous wing.

Sculpture throughout is excessively fine or microscopic, the fronto-vertex having extremely fine, shallow, thimble-like punctures; the face and cheeks much smoother or hardly perceptibly shagreened under high magnification; the mesoscutum with very fine scale-like reticulations, the axillae and scutellum with similar sculpture but nevertheless duller, although not opaque; the mesopleura anteriorly with very fine reticulate shagreening, but becoming much smoother on the posterior half; the abdomen entirely smooth and polished.

Pubescence of head unusually sparse, the eyes being perfectly glabrous, but the frontovertex has an orbital row on each side of a few fine setae set in minute pin-punctures, and there is a row of very fine setae on each side of the face at the outer margin of the scrobal impression, each row encircling the antennal sockets and ascending on each side of the facial prominence to about opposite the upper end of the sockets; mesonotum including scutellum with more or less numerous reclinate setae of normal structure, which are scarcely seriately arranged; abdomen with a row of fine setae on each side of the basal tergite and rather sparsely pubescent on the sides towards the apex; legs and antennae with the usual amount of pubescence; pubescence of the body dark-colored throughout, and not conspicuous.

Coloration of body usually bluish-black, with more or less purple luster on the head and abdomen; the mesoscutum and often the frontovertex, metallic green; wings typically more or less deeply infuscated at extreme base and on the apical two-thirds, but the cloud becomes gradually fainter towards the apex, and is interrupted by a hyaline area at the end of the stigmal vein and by another area on the opposite margin of the disc.

Male. Differs from the female mostly in the structure of the head and antennae. The head is much thinner fronto-occipitally, the eyes considerably smaller, the frontovertex much broader or hardly longer than wide; the face with a similar scrobal impression which reaches upward between the eyes. Antennae inserted just below a line connecting the lower corners of the eyes; the scape rather short but reaching beyond the scrobal impression; pedicel not over twice as long as thick at apex and much shorter than the first funicle joint; flagellum slender and cylindrical, clothed with long, scattered, semi-erect setae; the funicle joints all much longer than thick, the club elongate and about equal to the last two funicle joints combined. Sculpture, pubescence and coloration of the same type as in the female, but the wing pattern is much fainter, although usually apparent.

Genotype: *Echthrogonatopus hawaiiensis* Perkins.

This genus is closely allied to *Echthrogonatopus* Perkins, which in turn is similar to *Epiencyrtus* Ashmead, but *Echthrogonatopus* as represented by its genotype, *E. exitiosus* Perkins, has no foveae on the vertex, the eyes are slightly pubescent, the mandibles with the teeth nearly equal, the scutellum densely and opaquely sculptured, the mesoscutum with appressed, rather dense whitish pubescence, the middle tibiae less enlarged at apex, and the middle tarsi less thickened at base, the wings wholly hyaline, the disc ciliated throughout, the basal area being but little more sparsely pubescent, the speculum narrow and reaching from the stigmal vein obliquely nearly to the

opposite margin. In the male the scrobal impression is deeper and less rounded above, the antennae somewhat shorter, the pedicel longer, stouter and equal to the first funicle joint in length, the head much more coarsely sculptured.

To *Hypergonatopus* belong two species, hithertofore placed in *Echthrogonatopus,* viz. *E. hawaiiensis* Perkins and *Microterys molokaiensis* Ashmead. I am greatly indebted to Dr. James Waterston of the British Museum for carefully comparing specimens of *hawaiiensis* from the Hilo district of Hawaii with Oahu specimens, and for furnishing copious notes drawn up from the type of *molokaiensis.* It is hardly necessary to add that his assistance has greatly facilitated my work on the genus, which otherwise could not have been carried out as fully. Much more recently Dr. Perkins has returned the female type of *hawaiiensis* to the Islands, and I have thus had opportunity to study it personally.

The following synoptic tables may help in distinguishing the species.

FEMALES.

1. Head unusually thick; the wings truncated at apex of the stigmal vein and reaching only to the middle of the abdomen; legs yellow 6

   Head moderately thick; the wings fully developed; legs mostly blackish 2

2. Wings comparatively broad, about 2.6 to 2.7 times longer than wide; frontovertex about two and one-half times longer than wide 3

   Wings very narrow or about 2.9 times longer than wide; frontovertex about thrice as long as wide, marginal vein about thrice as long as the stigmal; apex of middle tibiae and middle tarsi brownish yellow, knee-joint of middle legs, apex of front and hind tibiae and corresponding tarsi brownish or sometimes somewhat yellowish ..... *hawaiiensis* (Perkins)

3. Legs distinctly brownish, somewhat paler towards the tips of the tibiae and on the tarsi, the apical third of middle tibiae and the middle tarsi yellowish 5

   Legs almost wholly blackish, except middle tarsi and tibial spur; the apex of middle tibiae only slightly yellowish 4

4. Facial ridge between antennae not completely dividing the scrobal impression; scutellum abruptly declivous at apex, its disc more densely pubescent; marginal vein typically about twice as long as the stigmal vein, the latter nearly straight and not greatly enlarged at apex ..... *vulcanus* n. sp.

Facial ridge between antennae extending the whole length of the scrobal impression; scutellum more uniformly convex and gradually declivous at apex, its disc more sparsely pubescent and bare at the sides; marginal vein about three and a half times as long as the stigmal, the latter enlarged towards apex and curved towards costal margin.....*oahuensis* n. sp.

5. Wings with faint brownish markings, the discal setae in the basal area weak and colorless, excepting a row next to the submarginal vein; marginal vein about two and one-third times as long as the stigmal .....*brunneipes* n. sp.

6. First funicle joint somewhat longer than wide and subequal to either of the last two funicle joints in length; metallic luster of body brilliant, the antennae and legs wholly yellow.....*flavipes* n. sp.

First funicle joint hardly longer than wide and distinctly shorter than the fifth or sixth funicle joint; metallic luster of body comparatively weak; antennae dark brown or fuscous, the scape somewhat yellowish except at base, the last two funicle joints dusky yellow; legs yellow, with the hind tibiae fuscous except at base and apex .....*hemipterus* n. sp.

MALES.

1. Antennal scape and legs largely black; scutellum duller than the mesoscutum 2

Antennal scape and legs, including coxae yellow; mesoscutum and scutellum metallic green with a brassy luster.....*flavipes* n. sp.

2. Wings about 2.5 to 2.6 times longer than wide..... 3

Wings narrower, about 2.7 to 2.9 times than wide; with faint markings and without a differentiated clear spot beyond apex of the stigmal vein; fifth funicle joint about 1.35 to 1.4 times longer than the first joint, the club hardly or not at all wider than the funicle and slightly longer than the first two funicle joints combined. *hawaiiensis* (Perkins)

3. Wings without a differentiated clear spot beyond apex of the stigmal vein 4

Wings with a clear spot beyond apex of venation set with weaker hyaline setae; marginal vein about four times as long as the stigmal; fifth funicle joint about 1.5 times longer than the first, the club very slightly longer than the first two funicle joints combined.* *molokaiensis* (Ashmead)

4. Wing pattern distinct, the area just beneath the marginal and stigmal veins deeply stained; medial setae of the basal area of disc strong and pigmented; fifth funicle joint about 1.33 times as long as the first, the club about one-fifteenth longer than the first two funicle joints combined.....*vulcanus* n. sp.

Wing pattern faint and indistinct, except in a small area just be-

* These characters are based on Dr. Waterston's examination of the

neath the marginal and stigmal veins; medial setae of the basal area of disc weak and hyaline; fifth funicle joint about 1.55 times as long as the first, the club about one-ninth longer than the first two funicle joints combined.....*brunneipes* n. sp.

Hypergonatopus hawaiiensis (Perkins). Figures 7-10.

Echthrogonatopus hawaiiensis Perkins, 1912, Haw. Sugar Planters' Exp. Stat., Ent. Bull. 11, p. 17.

Female. Head nearly hemispherical in shape, as seen from above almost perfectly semi-circular in outline; as seen from in front the cheeks arcuately converge so that the greatest width is about opposite the middle of the eyes; as seen from the side the outline is subtriangular, with the dorsal side moderately rounded and slightly shorter than the facial side, the greatest thickness fronto-occipitally being opposite the lower corners of the eyes; occiput only slightly concave; eyes of moderate size, broadly and slightly obliquely ovate, widest anteriorly and just contiguous with the occipital margin behind; frontovertex about three times longer than wide, slightly widening at the posterior ocelli; the ocelli arranged in an acute-angled triangle, the distance between the posterior type of *molokaiensis*.

pair about a fourth less than the distance from either to the anterior ocellus, the posterior pair about their own diameter from the eye-margin and nearly twice as far from the occipital margin; cheeks about as long as the width of the eyes; face with a rather large, nearly circular shallow scrobal impression reaching from the oral margin almost to the eyes, arcuately emarginated below by the mouth, and divided longitudinally by the broad low protuberance between the antennae, which usually reaches the upper margin of the impression.

Antennal scape moderately long, slender, and slightly widened at the middle, the ventral margin gently arcuate; pedicel as long as the first three funicle joints combined; first funicle joint a little longer than wide and somewhat longer than any of the three following joints, which are

Fig. 8. *Hypergonatopus hawaiiensis.* Antenna of female, with insert of club showing usual shape of the latter.

subequal in length but increase slightly in thickness distad, so that the fourth is a little wider than long; last two funicle joints distinctly longer than those just preceding, but only slightly longer than the first, the sixth barely wider than long; club much wider at base than the preceding joints, and about equal to the last five funicle joints combined.

Thorax moderately convex above; the pronotum weakly arcuate, its

posterior margin subangulated medially; mesoscutum about twice as wide as long; axillae twice as wide as long and acutely meeting medially; disc of scutellum rather convex, the sides and apex strongly elevated and declivous; propodeum sloping backward, very short medially, and moderately long at the sides. Abdomen about one-half as long as the thorax, moderately convex below, and concave above behind the first tergite.

Fig. 9. *Hypergonatopus hawaiiensis.* Forewing of female.

Wings long and narrow, about 2.9 times longer than wide; marginal vein elongate and about three times as long as the stigmal, the latter short and triangularly enlarged towards apex, the postmarginal rapidly tapering and somewhat shorter than the stigmal; speculum narrow and passing into the bare area at the middle of the disc nearly opposite to the end of the submarginal vein; this partly bare basal area with a short row of setae at the posterior margin of the disc, connecting with a group of scattered setae just below the submarginal vein; rest of the disc densely setose, but the setae become finer and hyaline in two areas, one just beyond the apex of the stigmal vein, the other on the opposite side of the disc.

Frontovertex with very fine, shallow, thimble-like puncturation which is slightly coarser and more evident than in *flavipes* or *hemipterus*, this sculpture becoming very delicate or hardly perceptible on the face, and absent on the cheeks, which are smooth and polished; frontovertex also with a row of fine pin-punctures along each orbit; mesonotum with fine, scaly reticulations, the mesoscutum being highly polished, the axillae and scutellum considerably duller, the reticulations on the scutellum becoming finer and at last obliterated towards the apex; both the scutum and scutellum with rather numerous fine, scattered pin-punctures which become somewhat thicker on the apical part of the scutellum; anterior part of mesopleura very delicately rugulosely reticulate, the posterior half becoming smoother; propleura and prepectal plates with delicate reticulations somewhat coarser than the sculpture of the mesoscutum; abdomen smooth and highly polished.

Pubescence as described under the genus, the setae on the mesoscutum and scutellum moderately numerous, or considerably thicker than in *flavipes*, the basal tergite of abdomen with a row of only about four setae on each side.

General color bluish-black, the vertex, postorbital region, mesoscutum, lateral and apical margin of scutellum either metallic green or with a strong greenish luster; basal tergite of abdomen metallic greenish with a brassy and purple luster, the venter usually with a more or less evident brassy luster; other parts of the body with a purple luster, which is sometimes brilliant especially on the cheeks and posterior half of the mesopleura, but the axillae and scutellum considerably duller than the rest of the thorax; antennae and legs dark fuscous, the scape and femora nearly black, the apex of front and hind tibiae and corresponding tarsi somewhat brownish, the apical fourth of middle tibiae and the middle tarsi brownish yellow, middle trochanters and a narrow annulus near the base of the middle femora pale yellowish; wings with a small fuscous cloud at extreme base, and a transverse cloud beneath marginal vein extending to the opposite margin, medially produced towards the apex where it expands in the middle of the apical half of the disc, and gradually disappears towards the margins; the cloud being delimited by a clear area at the end of the stigmal vein and by another on the opposite side of the disc, the latter area somewhat fusiform in shape, extending parallel with the margin and basally produced into the transverse cloud beneath the marginal vein.

Length of body, (1.06 to 1.37) 1.33; length of head, 0.462; width of head, 0.487; thickness of head, 0.287; width of vertex at anterior ocellus, 0.120; width of mesoscutum, 0.478; length of forewing, 1.18; width of forewing, 0.407 mm.

Male. Head much thinner fronto-occipitally than in the female, the occiput more deeply concave; as seen from the side it is thickest above the middle, the facial outline meeting the plane of the frontovertex in an angle of somewhat more than 90 degrees; eyes much smaller, somewhat less broadly oval but otherwise about as in the female; frontovertex about a fourth longer than wide, the ocelli arranged in a nearly equi-

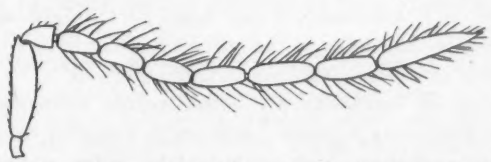

Fig. 10. *Hypergonatopus hawaiiensis.* Antenna of male.

lateral triangle, the anterior ocellus placed a little in front of the middle of the frontovertex; the posterior pair about one-half of their own diameter from the eye-margin, and nearly twice as far from the occipital margin; cheeks nearly twice as long as wide and nearly as long as the eyes; scrobal impression of face subcircular, somewhat longer than wide, reaching upward between the eyes, and divided in its lower two-thirds by the longitudinal low prominence between the antennal sockets. Antennae inserted just below the line connecting the anterior corners of the eyes,

and rather close together, the sockets just touching the ocular line and placed about their own length apart; scape much shorter than in the female and slightly expanded beneath, its length including radicle joint about equal to the pedicel and first two funicle joints combined, yet reaching well beyond the scrobal impression; pedicel about twice as long as thick and two-thirds as long as the first funicle joint; first three funicle joints about three times as long as thick, the following joints somewhat longer, the fifth a little longer than either the fourth or sixth; club slender, tapering to acute apex, about one-ninth longer than the first two funicle joints combined. Thorax and abdomen practically as in the female; the wings a little shorter and wider, about 2.7 to 2.75 times longer than wide, the discal setae about the same, except that there is no area of weaker, hyaline setae at the apex of the venation or on the opposite side of disc. Thimble-like punctures of frontovertex much coarser than in the female, being rather prominent but shallow; sculpture and pubescence otherwise very similar to that of female. Coloration agreeing closely with female, except that the wing-pattern is considerably reduced and much fainter, the extension of the cloud medially often being extremely faint.

Length of body, (0.83 to) 1.06; length of head, 0.370; width of head, 0.412; thickness of head, 0.119; width of vertex, 0.167; width of mesoscutum, 0.372; length of forewing, 1.10; width of forewing, 0.422 mm.

Redescribed from the following specimens all reared from Dryinid cocoons on sugar-cane collected by Mr. Swezey: 5 females, 1 male, Mountain View, Hawaii, August 26-30, 1916; 4 females, Papaikou, Hawaii, October 23, 1908; 3 females, 1 male, Hilo Sugar Company, near Hilo, Hawaii, February 27, 1919; 1 male, Waiakea, Hawaii, July 2, 1913; and 1 female, 1 male, Waiakea, Hawaii, April 13, 1916. The host of this series presumably is *Echthrodelphax fairchildii* Perkins, although there is a possibility that some of the specimens may have come from the cocoons of *Haplogonatopus vitiensis* Perkins.

The type of *hawaiiensis*, a female reared from the cocoon of *Pseudogonatopus perkinsi* (Ashmead), collected by Dr. Perkins in the mountains back of Honolulu, differs slightly from Hawaiian specimens as follows:

Head appears to the eye somewhat thicker fronto-occipitally, but there is hardly any difference by actual measurement; the frontovertex is slightly narrower, with the ocelli in a more acutely angled triangle, the distance between the posterior pair being slightly more than half the distance between either and the anterior ocellus; the facial prominence slightly more arched from end to end, and not quite reaching to the upper margin of the facial impression; eyes just barely separated from the

occipital margin; pedicel slightly longer than the first three funicle joints combined, the first funicle joint about a half longer again than the second; wings 2.92 times longer than wide, the marginal vein slightly over three times as long as the stigmal, pubescence of the mesoscutum and scutellum slightly sparser; coloration the same, except that the apex of the middle femora and the tips of the front and hind tibiae and corresponding tarsi are paler and more yellowish.

Length of body, 1.15; length of head, 0.408; width of head, 0.434; thickness of head, 0.264; width of vertex at anterior ocellus, 0.166; width of mesoscutum, 0.401; length of forewing, 0.990; width of forewing, 0.339 mm.

Dr. James Waterston also kindly compared a male from Oahu furnished by Dr. Perkins (a reared specimen from Tantalus, 1906, and presumably from the type series) with a male from Mountain View, Hawaii, and found the wing pattern slightly more distinct, the basal cloud being more extensive and the disc beyond the venation more deeply tinted medially; the marginal vein proportionately shorter; the club somewhat wider than the funicle and slightly longer than the first two funicle joints combined, the fifth funicle joint about 1.4 times as long as the first joint. This male, according to Dr. Waterston, was only about 0.95 mm. long, the forewing 0.86 mm. long and 0.30 mm. wide.

Hypergonatopus molokaiensis (Ashmead).

Microterys molokaiensis Ashmead, 1901, Fauna Hawaiiensis, 1, p. 322.

This species was described from a single male specimen taken in the mountains of Molokai at three thousand feet, by Dr. Perkins, in June, 1893.

Dr. Waterston's notes on this specimen are as follows:

"Wings hyaline, with the following clouding: veins brown; at the base of the wing a light brown triangular patch occupying the basal one-third of the submarginal cell and sloping to a point on the hind margin opposite the middle of the submarginal vein. It occupies the distal two-thirds of the oblique 'hairless line.' There is the usual clear space distally, parallel to the hind margin, extending in this case to a little beyond half. Beyond the level of the radial knob there is a faint small median cloud connected indistinctly with that behind the marginal.

Dimensions (of wing): Length, 1.15 mm; breadth, 0.44 mm.

Submarginal: marginal: radius: postmarginal:: 170: 60: 15: 15.

Chaetotaxy: On the marginal about ten bristles with twenty-five behind, the latter bristles much closer set than in *hawaiiensis*. Clear space beyond radius larger, with twenty to thirty hyaline bristles.

PROPORTIONS OF ANTENNAL JOINTS (FUNICLE AND CLUB).

	1	2	3	4	5	6	Club
Length	30	34	36	38	45	39	68
Breadth	15	15	16	16	17	17	20''

Hypergonatopus vulcanus n. sp.

Female. Similar to *hawaiiensis* but the eyes are slightly smaller and very narrowly separated behind from the occipital margin, their inner orbits more parallel; frontovertex wider or about two and one-half times longer than wide; ocelli arranged in a nearly equilateral triangle, the distance between the posterior pair hardly less than the distance from either to the anterior ocellus; scrobal impression of face slightly deeper; antennae similar, but the first funicle joint is proportionately a little longer, the sixth funicle joint more abruptly wider than the preceding joint; wings shorter and wider or about 2.6 to 2.7 times longer than wide, the marginal vein shorter or only slightly more than twice as long as the stigmal, the latter proportionately longer, nearly straight and more nearly of the same thickness throughout, the postmarginal also proportionately longer. Sculpture hardly distinguishably different from *hawaiiensis*, but apparently a little coarser.

Coloration as in *hawaiiensis*, but with somewhat weaker metallic luster, legs somewhat darker, the pale annulus at base of middle femora hardly apparent, the middle tibiae almost wholly dark, or only slightly brown or yellowish at extreme apex. Wings with a small, somewhat semi-circular darker cloud just beneath the marginal and stigmal veins, the pattern otherwise similar.

Length of body, (0.94 to) 1.05; length of head, 0.358; width of head, 0.407; thickness of head, 0.233; width of vertex at anterior ocellus, 0.120; width of mesoscutum, 0.370; length of forewing, 0.933; width of forewing, 0.356 mm.

Male. Similar to the male of *hawaiiensis*, differing principally in the shorter, wider wings, which are about 2.5 times longer than wide; the club somewhat wider than the funicle and proportionately shorter, or only about one-fifteenth longer again than the first two funicle joints combined. Coloration similar with differences as noted in case of the female, the wings, however, more deeply stained, a small spot beneath the marginal and stigmal veins being very deeply pigmented.

Length of body, 0.91; width of vertex, 0.162; width of mesoscutum, 0.353; length of forewing, 0.943; width of forewing, 0.379 mm. The head is slightly shrunken so that other measurements are not possible.

Described from four females, two males (holotype, allotype, and paratypes) reared from a Dryinid cocoon, probably of *Pseudogonatopus perkinsi* (Ashmead), Kilauea, Hawaii, February 8, 1917 (F. Muir), and from the following paratypes:

One female collected at twenty-nine miles, Kilauea, Hawaii,

January, 1917 (Giffard and Muir), with length of body, 1.22 mm. and marginal vein about 2.9 times longer than the stigmal.

One female collected at an old steam crack, four thousand feet, Kilauea, Hawaii, September 8, 1919 (W. M. Giffard), body 1.11 mm. long and marginal vein slightly less than three times longer than the stigmal.

One female dissected from a Dryinid cocoon, probably of *Pseudogonatopus perkinsi,* which in turn was reared from parasitized nymphs of *Ilburnia coprosmicola* Muir, collected on *Coprosma ernodioides* at twenty-seven miles, near Kilauea, Hawaii, July 30, 1918 (W. M. Giffard), has the body 1.19 mm. long and the marginal vein only slightly longer than the stigmal, the apex of scutellum, sides of propodeum and base of abdomen with a brilliant purple luster.

This series of *Hypergonatopus* from the Kilauea region, Hawaii, shows a remarkable degree of variation in the proportions of the marginal and stigmal veins, but as I cannot discover any other tangible differences between the extremes, it seems reasonable to suppose that they all belong to one species. The holotype shows an intermediate condition.

Hypergonatopus oahuensis n. sp.

Female. Very similar to *vulcanus* and differing in the same way that it does from *hawaiiensis,* but the facial prominence between the antennae extends the whole length of the scrobal impression, the head is thicker fronto-occipitally, the scutellum more uniformly convex, with the declivity at apex distinctly more gradual. Sculpture similar, but the reticulation of the scutellum is coarser and distinctly enlarging towards the sides, a condition which holds in a lesser degree for *vulcanus;* pubescence considerably sparser on the scutellum, the sides of which are entirely bare, and the median longitudinal rows of setae are made up of only about five or six bristles.

Similar to *vulcanus* in coloration, or bluish black with a green luster on frontovertex, mesoscutum, apex of scutellum and on the basal tergite of abdomen in some aspects; other parts of the body with a bluish luster which is weak except on the abdomen; antennae black and becoming slightly brownish on the flagellum; legs black, with front and hind tarsi brownish, the apex of middle tibiae and the middle tarsi brownish yellow.

Wings very similar to *vulcanus,* but the marginal vein is 3.5 times longer than the stigmal, the latter enlarged towards apex and curved towards the costal margin.

Length of body, 1.18; length of head, 0.398; width of head, 0.426;

thickness of head, 0.273; width of vertex at anterior ocellus, 0.120; width of mesoscutum, 0.393; length of forewing, 1.12; width of forewing, 0.422 mm.

Described from one female (holotype), collected on Mt. Kaala, Oahu, between 2500 and 3000 feet elevation, July 22, 1917 (Timberlake).

Hypergonatopus brunneipes n. sp.

Female. Very close to *vulcanus*, but having the head somewhat broader and slightly thinner fronto-occipitally; thorax more robust and wider, the scutellum wider across the base; sculpture of the mesonotum somewhat coarser, and the pubescence of the mesoscutum very much sparser; setae in the hyaline area near base of forewing greatly reduced in size and hyaline; marginal vein about 2.7 times longer than the stigmal, the latter enlarged at apex and curved towards the costal margin.

Coloration similar to *vulcanus*, the head with a rather weak bluish and purple luster on the frontovertex; the mesoscutum and apex of scutellum metallic green, the abdomen above and side of propodeum with a strong purple luster, changing to greenish in some aspects on the basal tergite, the venter with a greenish luster; mesopleura dark brown, shining but hardly metallic; antennae and legs dark brown, with apex and base of front tibiae, apex of middle femora, apical half of hind tibiae, and front and hind tarsi pale brown, the trochanters, annulus at base of femora, apical third of tibiae and the tarsi of middle legs yellowish. In one specimen (paratype) the pleura and legs are much paler brown. Wing markings similar to *vulcanus*, but much fainter.

Length of body (1.01 to 1.16), 1.14; length of head, 0.386; width of head, 0.473; thickness of head, 0.249; width of vertex at anterior ocellus, 0.120; width of mesoscutum, 0.412; length of forewing, 1.06; width of forewing, 0.403 mm. The head is slightly shrunken, but the measurements are believed to be tolerably accurate.

Male. Very similar to the male of *vulcanus*, but differing in the same way as the female in regard to the sculpture, pubescence and wing characters. Coloration similar to that of the female but the upper part of the face and the frons with a greenish luster, the lower part of the face, the cheeks and vertex with a purple luster, and the pleura, antennae and legs are rather pale brown. Wings almost hyaline, excepting a small spot beneath the marginal vein.

Length of body, 0.98; width of vertex, 0.174; width of mesoscutum, 0.396; length of forewing, 1.05; width of forewing, 0.417 mm. The head is so much shrunken that other measurements are not possible.

Described from three females, one male (holotype, allotype, and paratype), reared from a Dryinid cocoon, probably of *Pseudogonatopus perkinsi* (Ashmead), reared in turn from *Ilburnia koae* (Kirkaldy), Kilauea, Hawaii, January, 1915 (F. Muir).

Hypergonatopus flavipes n. sp.

Female. Head large and unusually thick fronto-occipitally, forming somewhat more than a hemisphere and distinctly wider than the thorax; dorsal surface very strongly and uniformly convex, the anterior outline forming a considerably larger arc than a semicircle; as seen from in front the outline is perfectly rounded above, but the cheeks converge slightly in a curve to the broad and truncate oral margin; as seen from the side the anterior outline is well rounded except that the face is slightly flattened at the scrobes; occiput only slightly concave; eyes very large and broadly oval, widest anteriorly and touching the occipital margin behind; frontovertex about six times longer than the least width, very narrow anteriorly and gradually widening behind so that the width is about one-half greater at the occipital margin; ocelli very minute and arranged in a very acute-angled triangle, the anterior ocellus at the center of the frontovertex, the posterior pair touching the eye-margin and far removed from the occipital margin; cheeks a little more than one-half as long as the eyes and very broad above; face only slightly inflexed, the scrobes in the form of a shallow, very broadly ovate impression about as wide as long and divided below by a broad, low ridge between the antennae, the impression of about the same size and depth as in *hawaiiensis*, but less circular.

Antennal scape slender, curved, slightly wider at the middle, the ventral margin arcuate; pedicel as long as the first two funicle joints combined; first funicle joint somewhat longer than wide and about equal to either of the last two joints in length, but considerably narrower; next two joints about as wide as long, the fourth somewhat shorter and slightly wider than long, the last two joints distinctly longer than those preceding, the fifth about as wide as long, the sixth slightly wider than long; club missing except part of the basal joint, but presumably about as in *hemipterus*.

Thorax rather depressed above, the pronotum transverse, with its posterior margin only slightly arcuate; mesoscutum short and strongly transverse or about two and one-half times wider than long; axillae not greatly wider than long, and slightly separated medially; scutellum distinctly longer than wide, rather acute at apex, the disc depressed, the lateral margins and apex well elevated and declivous. Abdomen hardly longer than one-half of the thorax, the first tergite prominent, the following tergites deeply sunken in and telescoped within the first segment.

Wings of the hemipterous type or truncated at apex of the stigmal vein, the apical margin rounded, marginal vein between four and five times longer than thick and about thrice as long as the stigmal, the postmarginal slightly shorter than the stigmal vein; area of disc beneath the submarginal vein with about six or seven scattered, very minute hyaline setae; area beneath the marginal vein densely setose, the speculum distinct.

Frontovertex with excessively minute and delicate thimble-like sculp-

ture appearing smooth under low magnification, and with a row of sparse, minute, setiferous punctures at the orbits; mesoscutum polished and with very fine, scale-like reticulations, the axillae and scutellum slightly duller with similar reticulations, those of the scutellum somewhat coarser; mesonotum also with a few, extremely minute, scattered setiferous pin-punctures, those of the scutellum slightly larger and rather more numerous, and distributed sparsely over the disc from base to apex; mesopleura microscopically rugulose anteriorly, but becoming smooth on the posterior half, prepectal plates finely reticulate; propodeum smooth and polished, and with a median carina; abdomen smooth and highly polished.

Pubescence of the head about as in *hawaiiensis;* collar of pronotum with a row of fine setae somewhat coarser than those of the head, mesoscutum with sparse scattered setae like those of pronotum, the scutellum with slightly coarser, more numerous setae; sides and apex of abdomen with a few fine setae, the basal tergite with a row of about six fine setae on each side near the middle.

Head blue-black with a purple luster; mesoscutum bright metallic green, the axillae and scutellum duller green; pronotum, pleura and propodeum with a strong purple luster; basal tergite of abdomen bright metallic green, the remainder of abdomen brilliant metallic purple; antennae and legs entirely yellow, the coxae and base of femora paler, the general color approximating yellow ocher of Ridgway; apical fourth of wing beneath marginal vein and small area at extreme base fuscous, the marginal and stigmal veins dark brown, but submarginal except basal part nearly hyaline; pubescence of body dark and inconspicuous.

Length of body, 1.18; length of head, 0.476; width of head, 0.490; thickness of head, 0.332; least width of frontovertex, 0.073; width of mesoscutum, 0.424; length of forewing, 0.552; width of forewing, 0.216 mm.

Male. Differs from the female principally in the shape of the head, which is much thinner fronto-occipitally with the face distinctly inflexed; as seen from above the outline of the head is semicircular; as seen from in front the cheeks arcuately converge more strongly than in the female; as seen from the side the dorsal part is well rounded, but the face from the lower third of the eyes to just above the clypeal margin is strongly flattened and forms an obtuse angle with the plane of frontovertex; eyes hardly more than one-half as large as in the female, broadly oval and widest near the middle; frontovertex with parallel sides and about a half longer again than wide; ocelli large, arranged in a nearly equilateral triangle, the posterior pair only slightly farther apart than the distance from either one to the anterior ocellus, about one-half their diameter from the eye-margin and about one and one-half times their diameter from the occipital margin; cheeks longer than wide and slightly longer than the width of the eyes; face comparatively larger than in the female, the upper part surrounding the antennal sockets distinctly flattened and also continuous with the scrobal impression, which is semicircular and

reaches upward between the eyes. Antennae inserted close together on a level with the lower corners of the eyes, the sockets less than own length apart; scape somewhat shorter and straighter than in the female, but otherwise similar, the rest of antennae missing. Wings evidently not abbreviated as in the female, but they have been much mutilated by psocids, the apical half of each missing, but enough remains to show a fuscous cloud beneath the marginal vein, bounded by the speculum towards the base of the wing. Sculpture of the frontovertex more distinct than in the female, the reticulation of the mesoscutum somewhat coarser and distinctly enlarging along its anterior margin especially medially, the reticulation of scutellum about like that of the scutum. Pubescence as in the female, except that the fine setae on the lower part of the face are more scattered and arranged transversely near the clypeal margin. In other structural characters and in coloration agreeing closely with the female.

Length of body, 1.06; length of head, 0.391; width of head, 0.431; thickness of head, 0.231; width of frontovertex, 0.172; width of mesoscutum, 0.403 mm.

Described from three females, one male (holotype, allotype, and paratypes) reared from a Dryinid cocoon, presumably of *Pseudogonatopus perkinsi* (Ashmead), collected at Halawa, Oahu, September 12, 1909 (O. H. Swezey).

Hypergonatopus hemipterus n. sp. Figure 11.

Female. Structurally nearly identical with *flavipes*, but the scape is a little narrower and widest just beyond the middle; the first funicle joint hardly longer than wide and distinctly shorter than either the fifth or sixth joint, the second to fourth joints subequal with the fourth, only a trifle shorter, the last two funicle joints as in *flavipes;* club considerably wider than the last funicle joint and as long as the five preceding joints combined, its apical joint obliquely truncate beneath. Wings

Fig. 11. *Hypergonatopus hemipterus.* Antenna of female.

abbreviated in the same manner, but more squarely truncate at apex; marginal vein shorter and stouter, but over three times longer than the stigmal, the postmarginal stout and a little longer than the stigmal. Sculpture and pubescence nearly the same as in *flavipes*, although the mesonotum is slightly more coarsely reticulate.

Coloration similar, but the metallic luster is much weaker and the antennae and hind tibiae are much darker; head shining black, with a very weak bluish luster, except the cheeks and postorbital region which have a rather strong purplish and dark green luster, mesosnotum metallic

green, the axillae and scutellum not much duller than the mesoscutum; pronotum and pleura darker than in *flavipes*, the purple luster on the latter rather strong, propodeum shining, metallic brownish as in *flavipes*; abdomen the same as in *flavipes* except that the metallic luster is greatly diminished; antennae dark brown or fuscous, the scape except at base suffused with yellowish, and the last two funicle joints dusky yellow; legs yellow as in *flavipes*, but the hind tibiae are fuscous except at base and apex; wing markings as in *flavipes*.

Length of body, 1.11; length of head, 0.426; width of head, 0.419; thickness of head, 0.273; least width of frontovertex, 0.064; width of mesoscutum, 0.351; length of forewing, 0.469; width of forewing, 0.191 mm.

Described from two females (holotype and paratype), collected along the trail on Kaumuohona, Oahu, January 7 and September 9, 1917 (Timberlake).

Aulonops n. g.

Closely allied to *Hypergonatopus* and differing chiefly in the shape of the head, and particularly of the face. Outline of the head as seen from above semi-circular, as seen from the side triangular with the dorsal and facial sides about equal, their planes meeting in a somewhat acute angle, the dorsal outline moderately convex and the facial side concave; as seen from in front, the head is considerably wider than long, the dorsal surface strongly rounded from side to side, the cheeks from a short distance below the eyes converging sharply to the broad and emarginate oral margin; occiput rather deeply concave; eyes moderately

Fig. 12. *Aulonops bifasciata.* Mandible of female, anterior view.

large, broadest anteriorly and almost touching the occipital margin behind; frontovertex about thrice as long as wide, and with a small fovea at each posterior corner; cheeks rather short and strongly narrowing towards the mouth.

Face considerably inflexed and with a deep transverse scrobal impression suggestive of the conditions found in *Chrysoplatycerus*, but here the angle between the face and the frons is well rounded off, and the angle between the anterior and posterior face of the impression is obtuse; as seen in frontal view of head the outline of the impression is nearly square except that the anterior corner of the square is strongly truncated by the mouth; posterior face of the impression is furthermore concave from side to side and has two narrow, shallow, longitudinal furrows near the middle to receive the scapes at rest; anterior face of the impression is much smaller and composed for the most part of the

broad, slightly convex space between the antennal sockets. Mandibles similar, but the two inner teeth are very short and subequal, and taken together they are deeply divided from the long, acute ventral tooth.

Scutellum distinctly longer than in *Hypergonatopus* and more pointed at apex. Middle tarsi nearly of the same thickness from base to apex. Abdomen of the same size and shape, but the ovipositor issues from near the base of the venter. Sculpture of the same type as in *Hypergonatopus*, but the reticulations of the mesoscutum are very faint, and the scutellum is nearly smooth and not duller than the scutum. In other respects similar to species of *Hypergonatopus*.

Genotype: *Aulonops bifasciata* n. sp.

Aulonops bifasciata n. sp. Figures 12-14.

Female. Frontovertex narrowest in front of the ocelli and slightly widening towards the occipital margin; ocelli in an acute-angled triangle, the distance between the posterior pair about a third less than the distance from either to the anterior ocellus, the posterior pair about one-half their own diameter from the eye-margin and somewhat more than twice as far from the occipital margin. Scape slender, reaching beyond the scrobal impression, thickest at the middle, the ventral margin slightly arcuate; pedicel nearly three times as long as thick at apex and fully equal to the first three funicle joints combined; flagellum gradually increasing in thickness distad; funicle joints all wider than long, the first four nearly equal in length, the first one but slightly wider than long,

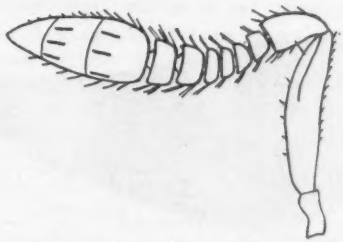

Fig. 13. *Aulonops bifasciata.* Antenna of female.

the fourth about twice as wide as long, last two funicle joints about twice longer than those preceding, each about one-half wider again than long; club rather elongate oval in shape, somewhat obliquely truncate and acute at apex, and about equal in length to the funicle and one-half of the pedicel combined.

Mesoscutum strongly transverse or nearly two and one-half times wider than long, its posterior margin straight; axillae about two and one-half times as wide as long, their inner tips very acute and nearly meeting; scutellum about one-half longer again than the scutum, rather strongly convex and declivous at the sides and apex. Forewing about 2.54 times longer than wide; the marginal vein elongate or about four times as

long as the stigmal, the latter rather short and capitate at apex, the postmarginal about one-half as long as the stigmal; setae of the disc arranged nearly as in *Hypergonatopus hawaiiensis*, except that there is a short, bare area extending entirely across the disc beneath the apical part of the submarginal vein.

Frontovertex with microscopic, shallow, thimble-like puncturation and with a row of fine pin-punctures at the margin of the eyes; face and lower part of the cheeks very finely and delicately reticulate, the cheeks becoming smooth and polished next to the eyes; mesoscutum microscopically reticulate and moderately shiny; the scutellum medially at base with a similar sculpture, which gradually becomes effaced towards the sides and apex, the disc also with a few scattered minute pin-punctures; mesopleura with very fine longitudinal lineolations on the anterior and ventral part, becoming smooth and polished posteriorly; abdomen entirely smooth and polished.

Pubescence, sparse, dark-colored and inconspicuous, the eyes glabrous, the mesoscutum and disc of scutellum with very fine scattered setae; the abdomen with a few very fine setae at the sides and apex.

Head and body shining, bluish black with a blue or purplish luster, the cheeks next to the eyes, the mesopleura, propodeum and abdomen with a brilliant purple luster; face metallic greenish, the frontovertex and mesoscutum with a slight greenish luster in some aspects, but bluish in others; antennae and legs dark fuscous or blackish, the front and hind tarsi, apex of middle femora and tibiae brownish, the middle tarsi,

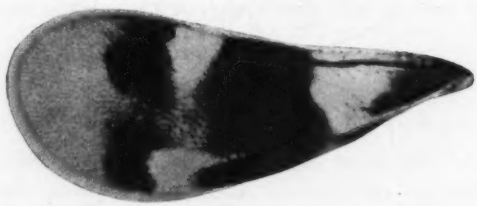

Fig. 14. *Aulonops bifasciata.* Forewing of female.

except the apical joint and the tibial spur, brownish yellow. Wings with a dark brown cloud except on the apical fourth, the cloud broken by three clear hyaline spots, a large triangular spot beneath the submarginal vein, an acutely angular spot suspended from the costal margin at apex of the stigmal vein, and a somewhat quadrate spot opposite which is narrowly extended basad on its inner side; the space between these two clear areas about as wide as one-third of the disc and less deeply pigmented, as is also the case with the middle portion of the clouded area just distad.

Length of body, 1.09; length of head, 0.375; width of head, 0.466;

thickness of head, 0.259; width of vertex at anterior ocellus, 0.118; width of mesoscutum, 0.429; length of forewing, 1.09; width of forewing, 0.427 mm.

Described from one female (holotype), collected in the Waianae Mountains between Kolekole Pass and Mt. Kaala, Oahu, March 9, 1911 (D. T. Fullaway).

Euchalcerinys n. g.

Female. Head moderately thick fronto-occipitally, the face strongly inflexed; as seen from above more strongly rounded on the sides than anteriorly; as seen from the side thickest considerably above the middle, the dorsal outline well rounded and somewhat shorter than the facial side; as seen from in front the outline is well rounded above, and slightly convergent on the sides towards the mouth, occiput moderately concave, its dorsal margin not strongly acute; eyes of medium size and nearly circular in outline, posteriorly just reaching to the occipital margin; frontovertex about three times as long as wide and without foveae at the posterior corners; ocelli arranged in an equilateral triangle, the posterior pair at the eye margins, and about thrice their own diameter from the occipital margin; cheeks about as long as the diameter of the eyes, and without a genal suture; face with a shallow, semi-oval scrobal impression extending upward between the lower borders of the eyes and divided inferiorly by the facial prominence between the antennal sockets, which is short, not greatly longer than wide, and convex below.

Antennae inserted a moderate distance apart, rather close to the oral margin, the distance between the sockets about a third greater than the distance from either to the oral margin and about one-half the distance from either to the nearest point of the eye; scape slender, and rather

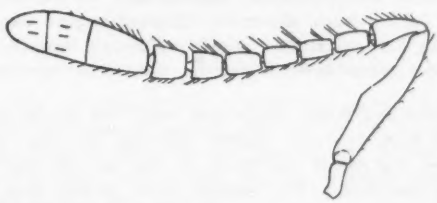

Fig. 15. *Euchalcerinys apicicornis.* Antenna of female.

long, reaching about to the plane of the frontovertex, and somewhat thicker at the middle; pedicel obconical, three times as long as thick at apex or nearly as long as the first two funicle joints combined; flagellum moderately clavate, the funicle joints all longer than wide, but distinctly increasing in thickness distad, the sixth joint about one-half wider again than the first; club three-jointed, large, oval, bluntly rounded at apex,

somewhat wider than the last funicle joint and as long as the four preceding joints combined.

Mandibles rather narrow at apex with three acute teeth, of which the two ventral are subequal and not deeply divided from each other, the inner or dorsal tooth considerably smaller; base of mandible moderately wide and expanded nearly in the same plane as the apex. Palpi short, the maxillary pair three-jointed, with the apical joint tapering and equal

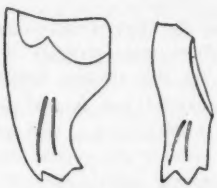

Fig. 16. *Euchalcerinys apicicornis.* Mandible of female, dorso-anterior and anterior views.

to the other two joints combined; labial palpi with three very short, equal joints, the two basal joints thickest at their union, the apical joint narrower and tapering.

Thorax of normal structure and robustness, the notum strongly convex; mesoscutum twice as wide as long, its posterior margin nearly straight, or only slightly produced medially; axillae over twice as wide as long, their inner tips very acute and meeting; scutellum about as long as the mesoscutum, or as long as its own width at the base, the disc strongly convex, the apex bluntly rounded; propodeum extremely short medially, but moderately long at the sides. Abdomen as wide as the thorax and nearly as long, triangular-ovate in shape and acute at apex; the basal tergite very prominent, longitudinally convex, and almost one-half as long as the whole abdomen; following tergites deeply sunken in and, excepting the apical one, mostly withdrawn beneath the first tergite; ovipositor barely exserted and not enclosed by the ventrites except basally.

Legs slender and rather longer than usual, the middle tarsi not much thickened at base and only slightly tapering, the spur of the middle tibiae slender and about two-thirds as long as the first tarsal joint. Wings large and broad, the venation much shorter than one-half the length of the disc; the submarginal vein close to the margin so that the costal cell is unusually narrow, marginal vein not much longer than wide and considerably shorter than the moderately long stigmal vein, the postmarginal vein very short and spur-like; speculum reaching nearly across the disc and widening below; disc beyond the speculum densely, uniformly pubescent, the setae in the basal area considerably sparser and larger, but becoming shorter and transparent towards the posterior margin.

Face, cheeks, most of pleura, the scutellum and abdomen smooth, the

abdomen being highly polished; frontovertex with microscopic, very shallow thimble-like puncturation, appearing smooth and shining under low magnification; mesoscutum very finely reticulate, the anterior end of the mesopleura very delicately lineolate.

Pubescence rather sparse and inconspicuously colored; the frontovertex with only a few fine setae, the eyes with rather sparse, very short, erect setae; mesonotum with sparse, subseriately arranged setae which are longer on the scutellum, the apex of the scutellum with a pair of still longer bristles; sides of propodeum and abdomen more thickly pubescent than other parts of the body.

Male. Head but little, if any, thinner than in the female; as seen from above, strongly rounded anteriorly, with the frons slightly protuberant and the occipital margin concave; as seen from the side, thickest just above the lower corners of the eyes, the dorsal side rather weakly rounded and much shorter than the facial side, the latter nearly straight except that the facial ridge between antennae is visible as a protuberance below; as seen from in front it is well rounded above, with the vertex slightly protuberant, but the cheeks converge below nearly straight to the moderately wide and somewhat emarginate oral margin; eyes somewhat smaller than in the female, nearly round with the posterior margin somewhat oblate; frontovertex about one-half longer again than wide; ocelli large, arranged in a little less than a right-angled triangle, the posterior pair slightly the farthest apart, about half their own diameter from the eye margin and twice as far from the occipital margin, the anterior ocellus placed at the middle of the frontovertex; cheeks nearly as long as the width of the eyes; the genal suture fine but distinct; face

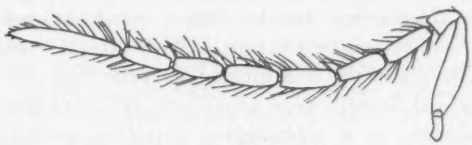

Fig. 17. *Euchalcerinys apicicornis.* Antenna of male.

with a rather deep, oval, longitudinal scrobal impression, extending from the oral margin well upward between the eyes or the whole length of the face, nearly twice as long as wide, and divided on the lower half by a well elevated ridge between the antennae, which is slightly convex from end to end as seen from the side.

Antennae inserted rather close together far from the oral margin, the upper ends of the sockets about touching the ocular line, the distance between the sockets nearly equal to the distance from either to the nearest point of the eye, and about one-fourth less than the distance from the lower end of the sockets to the oral margin; scape moderately long, reaching well beyond the scrobal impression, rather stout and fusiform in shape; pedicel somewhat longer than thick at apex and about equal to one-half of the first funicle joint; flagellum elongate, cylindrical,

rather densely clothed with long semi-erect hairs, which decrease in length on the club gradually towards the apex; funicle joints all about three times longer than thick, the club no thicker than the funicle, one-third as long and tapering to the acute apex.

Thorax, legs, and wings similar to the female, the abdomen much shorter, a little wider than long, rounded at apex, and about one-half as long as the thorax, the first tergite prominent, the following tergites, except the apical one, almost entirely concealed beneath the first, but not deeply sunken in.

Frontovertex with distinct but fine, thimble-like puncturation much more evident than in the female; face, except in the depths of the scrobal impression, and the inner margin of the cheeks very finely and mostly transversely lineolate; mesoscutum much more coarsely reticulate than in the female, the reticulations large anteriorly and gradually becoming much finer towards the posterior margin; shagreening of the mesopleura rather more evident and extensive than in the female; sculpture otherwise nearly as in the female.

Pubescence of head distinctly less sparse than in the female, there being fine setae scattered over the frontovertex, on the sides of the face and on the lower parts of the cheeks, and the setae of the mesoscutum are arranged much more distinctly in rows.

Genotype: *Euchalcerinys apicicornis* n. sp.

This genus is similar to both *Chalcerinys* and *Helegonatopus* of Perkins, but in each of those genera the head is thicker and the antennae are slenderer and inserted a little higher on the face. *Chalcerinys* besides has a much stronger, denser sculpture, a distinct genal suture, and the apical margin of the basal tergite distinctly emarginate; its male has the ridge between antennal sockets very prominent and extending towards the oral margin as a sublaminate rostriform crest; the scape very stout, moderately long, of equal width throughout, and somewhat spirally twisted, the pedicel short and flattened; the funicle joints all flattened, unequal in size but all longer than wide, the first joint largest, it being both wider and longer than the following joints. *Helegonatopus* also is much more sculptured than *Euchalcerinys*, the scutellum being opaque and densely shagreened, the genal suture distinct, the maxillary palpi four-jointed, the marginal vein about twice as long as thick and subequal to the stigmal; while the male has the scape rather short and flattened, very wide at base and strongly narrowed to the apex; the pedicel short, the flagellum slender, elongate cylindrical, clothed with long hairs as in *Euchalcerinys*,

but the funicle has only five joints decreasing in length distad, the morphological sixth joint having become fused with the club; the latter is as long as the last two funicle joints combined and shows a faint indication of a suture at its middle.

Euchalcerinys apicicornis n. sp. Figures 15-17.

Female. General color metallic bluish black; the face, cheeks, scutellum, pleura, and abdomen, except the basal tergite, with a purple luster; frontovertex slightly greenish, the mesoscutum more evidently metallic greenish in some aspects, but in others bluish black, the luster in direct dorsal view iridescent; apex of scutellum and basal tergite of abdomen metallic green with a brilliant variable luster, chiefly golden or brassy and purple; antennae dark brown, the base of the scape and radicle joint paler brown, the club pale brownish yellow; legs including coxae yellow, the hind tibiae slightly brownish on the basal half, the apex of last joint of the tarsi dark brownish; wings very faintly and uniformly tinted with fuscous or almost hyaline, the veins pale yellowish; mandibles and protruded part of ovipositor brown.

Length of body, 0.98; length of head, 0.391; width of head, 0.412; thickness of head, 0.214; width of vertex at posterior ocelli, 0.113; width of mesoscutum, 0.382; length of forewing, 1.20; width of forewing, 0.499; length of protruded part of ovipositor, 0.045 mm.

Male. General color metallic bluish black, but the face, inner half of the cheeks, frontovertex, mesoscutum, apex of scutellum and basal tergite of abdomen metallic green, the luster of these parts much less variable than in the female, the frontovertex dullest; outer half of the cheeks and disc of scutellum with a brilliant purple luster, the pleura and remainder of the abdomen with a weaker luster; antennae dark brown, the base of the scape and apex of the pedicel pale brown; legs colored as in the female, but the hind tibiae, except at base and apex, more distinctly brownish, and the first three joints of the hind tarsi are slightly brownish; other parts as in the female.

Length of body, 0.84; length of head, 0.329; width of head, 0.353; thickness of head, 0.207; width of vertex at posterior ocelli, 0.141; width of mesoscutum, 0.346; length of forewing, 1.09; width of forewing, 0.447 mm.

Described from one female (holotype) collected at Waiahole, Oahu, March 28, 1915 (O. H. Swezey); one male (allotype) collected at Kalihiuka, Oahu, April 27, 1919 (J. C. Bridwell); and one male (paratype) collected on the Manoa Cliffs trail, Oahu, September 1, 1918 (Timberlake), the latter specimen with the head missing.

Anabrolepis extranea Timberlake.

A second specimen of this interesting species was taken by

Dr. F. X. Williams on *Metrosideros* in the upper part of Manoa Valley, Oahu, on July 25, 1920. It has a pair of long, filiform bristles at apex of the scutellum, which were broken off in the type.

A specimen of *Anabrolepis* recently received from Dr. R. J. Tillyard, who reared it from *Aphelinus mali* material on apple from the United States (the real host was probably one of the Diaspinae), is close to *A. zetterstedtii* (Westwood). It differs from *extranea* in having the last two funicle joints yellowish; the pubescence of the mesoscutum somewhat sparser and blackish (in *extranea* the pubescence of the mesoscutum is neither so sparse nor dark-colored as indicated in the original description, but pale brownish and moderately abundant); the wings distinctly wider in proportion to the length, the pattern of the same type but differing slightly in detail, the apical dark area being longer than wide, the subapical clear spot on anterior margin strongly narrowed inwardly or subtriangular in shape, with only its inner apex provided with dark-colored setae, the setae of the marginal vein dense, coarse and tapering, and apparently none of them spear-shaped.

A. zetterstedtii, according to Mercet (Fauna Iberica, Himen., Fam. Encirtidos, p. 678, 1921), is similar to the above specimen from North America, but the pubescence of the pronotum and mesoscutum is white, and the antennae seem to be somewhat slenderer, with the last two funicle joints slightly longer than thick.

Quaylea whittieri (Girault).

Quaylea aliena Timberlake, Proc. Haw. Ent. Soc. 4, p. 216, 1919.

There seems to be no reasonable doubt that *aliena* is a synonym of *whittieri,* as the receipt of a large series from California discloses numerous specimens that cannot be distinguished from *aliena.* The differences pointed out in the description of *aliena* seem to be correlated, for the most part, with the smaller size of the types compared with the larger California specimens which I then had at my disposal, which were reared mostly from *Scutellista.*

This species has become one of considerable importance in California, as it has greatly increased since the introduction

of *Aphycus lounsburyi* Howard, and now parasitizes a large percentage of this *Aphycus* in certain localities.

An account of the introduction of *Quaylea* into California is given by Alexander Craw in his Horticultural Quarantine Report for the months of December, 1900 to April, 1901 (Eighth Biennial Report, State Board Horticulture, California, for 1901-2, pp. 196, 197, 1902). Craw calls the species *Hemencyrtus crawii*, a manuscript name given by Ashmead. I have seen one of the original specimens at Sacramento, Cal., determined by Craw as *Hemencyrtus crawii*, so that there is not any doubt about the identity of *crawii* and *Quaylea whittieri*.

I have also recently received a few specimens of this species from Dr. R. J. Tillyard, which were reared from *Saissetia oleae* at Sydney, New South Wales, by Mr. Luke Gallard.

Notes on the Identity and Habits of Blepyrus insularis Cameron (Hymenoptera, Chalcidoidea).

BY P. H. TIMBERLAKE.

(Presented at the meeting of December 1, 1921.)

The Encyrtid chalcid-fly described by Cameron under the name of *Encyrtus insularis* has been a puzzle to everyone who has attempted to identify the insect from the description alone, and it has consequently been described several times and referred to several incorrect genera.

For assistance in working out the synonymy of this parasite, I am much indebted to Dr. James Waterston of the Imperial Bureau of Entomology, who compared Hawaiian specimens with the type of *insularis* in the British Museum, and to Dr. R. C. L. Perkins for transmitting an old specimen which had been collected by Blackburn and retained by him as identical with the one sent to Cameron and described as *insularis*. This specimen, which is perfectly preserved, bears the No. 87. The actual type in the British Museum has fared worse, as Dr. Waterston reports that the antennae and abdomen have been lost. In regard to the comparison, Dr. Waterston writes

as follows: "I have compared them (i. e., the Hawaiian specimens forwarded under the name of *Blepyrus mexicanus*) with the torso of Cameron's type of *Encyrtus insularis,* and so far as I can see the two are identical."

Dr. Perkins in the Introduction to the Fauna Hawaiiensis (Vol. 1, Part 6, p. cvi, 1913) synonymized *Blepyrus marsdeni* Howard with *insularis,* but having failed to state his grounds for doing so, his action was not accepted by me in my former papers on Hawaiian Encyrtidae. It now appears that this synonymy was based on the Blackburn specimen mentioned above, and was of course correct.

Generic Characters of Blepyrus Howard.

Female. Form short, compact; head thin, menisciform, somewhat wider than the thorax; eyes very large, vertical, continuous with the occipital margin above, finely, rather densely, and shortly pubescent; frontovertex moderately wide, or about one-fourth as wide as the head, abruptly widened behind the ocelli; the latter arranged in a large, nearly equilateral triangle, the posterior pair close to the eye margins, and about their own diameter from the occipital margin; cheeks short, or about one-fifth the length of the eyes; face with a semi-oval scrobal impression reaching upward between the eyes, the depths of the scrobes in the form of shallow grooves converging from the antennal sockets, but not meeting

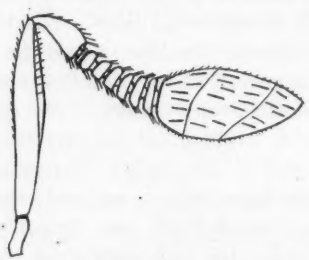

Fig. 1. ***Blepyrus insularis.*** **Antenna of female.**

above, the facial prominence between the antennae broad and low.

Antennae inserted rather far apart close to the clypeal margin, short and strongly clavate; scape slender, cylindrical, reaching nearly to the middle of the eyes and distinctly beyond the scrobal impression, pedicel a little longer than the first three funicle joints combined, the apical stalk connecting with the funicle very strongly capitate at its apex, forming a distinct but false ring-joint; funicle joints all short and transverse, the sixth over twice as wide as long; club very large, irregularly

oval, about as long as the pedicel and funicle combined, and much wider than the last funicle joint.

Mandibles narrow at apex, very unequally tridentate, the middle tooth much the longest, the inner tooth inserted much farther toward the base than the outer or ventral tooth; the base of the mandible rather wide and expanded in a plane at right angles with the plane of the apex. Palpi short, the maxillary pair with four joints, the two middle joints stoutest and only a little longer than thick, the basal joint nearly twice as long, and the apical joint about three times as long; labial pair with three joints, the middle joint hardly longer than wide, the apical joint about three times as long as thick, the basal joint a little shorter; labrum rather prominent, its apical margin transverse and ciliated with a row of fine hairs.

Thorax very robust and of great depth dorso-ventrally, the mesonotum strongly convex; pronotum almost vertical, the collar very short; mesoscutum about twice as wide as long, its posterior margin trisinuate, the median lobe of the sinuosity much the widest and overlapping, when in normal position, the inner angles of the axillae; the latter, therefore, often appearing slightly separated but actually meeting; scutellum slightly longer than the mesoscutum, rather acute at apex, the disc somewhat depressed towards the base, more rounded towards the sides and apex, which are moderately elevated and abruptly declivous at the margins; propodeum short and nearly of equal length at the sides and middle.

Wings of moderate size, the disc beyond the speculum densely ciliated; the costal cell nearly as densely ciliated; the basal part of disc more sparsely ciliated with longer setae, the row of setae guarding the proximal margin of the speculum much longer than the others; marginal fringe short throughout. Marginal vein between two and three times as long as thick; the stigmal rather long, or about thrice as long as the marginal, nearly straight but with the apex curved slightly towards the costal margin; postmarginal vein nearly a half longer than the stigmal.

Legs of about normal length and structure; middle tibiae somewhat enlarged at apex and with a row of about nine peg-shaped spines on the outer, apical margin, the spur stout and nearly as long as the first tarsal joint; middle tarsi rather stout and tapering to apex, the basal joint about equal to the next three joints combined, the plantar surface of the first four joints provided with numerous peg-shaped spines similar to those on the tarsi of *Eupelmus;* hind tibiae with two short unequal apical spurs; hind tarsi somewhat longer and slenderer than the middle pair, and without the conical spines on the plantar surface.

Abdomen a little shorter than the thorax, triquetrous in shape, the apex bluntly rounded, the dorsal surface, when not distorted, much depressed and only slightly hollowed behind the first tergite, the venter moderately compressed, the ovipositor entirely enclosed by the ventrites; cerci or vibrissal plates situated on each side of the dorsum just before the middle, the vibrissae reaching nearly to the apex of the abdomen.

Frontovertex with shallow, more or less confluent, thimble-like punc-

tures of considerable size, but nevertheless much smaller than the diameter of the ocelli; the scrobal impression of face smoothish, but with fine transverse lineolations; mesoscutum extremely finely reticulate and with numerous seriately arranged setiferous punctures; axillae and scutellum more opaque, being microscopically rugulose and with punctures like those of the scutum, the scutellum, however, becoming smoother and reticulate at apex; abdomen highly polished and with fine scale-like reticulations.

Pubescence on head and thorax rather thick, but not conspicuous because of its non-contrasting color, short and nearly erect on the fronto-vertex, larger, coarser, denser and more decumbent on the mesonotum, the apical part of scutellum becoming nearly bare, but with a pair of longer bristles at apical margin; abdomen nearly bare, but with a sparse fringe of moderately long, fine hair at the sides just below the lateral margins of the dorsum.

Blepyrus at present contains only a single species, as Ashmead's *phenacocci* is a typical species of *Chalcaspis* and must be cited in the future as *Chalcaspis phenacocci* (Ashmead). The genus evidently belongs to the Ectromatine group of genera notwithstanding the tridentate mandibles, as its relationship to *Pauridia, Aenasius, Chalcaspis, Zarhopalus,* etc., is apparent. Considered as a Mirine it is placed fairly well in Ashmead's tables, but *Coccophoctonus,* a synonym of *Blepyrus,* seems to be more accurately placed.

The following bibliography of *Blepyrus insularis* does not contain all the references to the species, but it is intended to include references to all new names and new combinations. The synonymy of *mexicanus, marsdeni, texanus,* and *dactylopii* was established through examinations of the types in the U. S. National Museum in 1917.

Blepyrus insularis (Cameron). Figures 1, 2.

Encyrtus insularis Cameron, Mem. Manchester Lit. & Phil. Soc. (3) 10, 1886, p. 243, female (not male). Honolulu, Oahu.

Blepyrus mexicanus Howard, Proc. U. S. Nat. Mus. 21, 1898, p. 234, female (excluding male). Monterey, Mexico.

Blepyrus marsdeni Howard, l. c., p. 234, female. Honolulu, Oahu.

Blepyrus texanus Howard, l. c., p. 235, female. Brownsville, Texas.

Coccophoctonus dactylopii Ashmead, Proc. U. S. Nat. Mus. 22, 1900, p. 375, female (not male). Honolulu, Oahu (not Australia).

Bothriothorax insularis Ashmead, Fauna Hawaiiensis, 1, Part 3, 1901, p. 321, female (not male). Hawaiian Islands.

Blepyrus insularis Perkins, Fauna Hawaiiensis, 1, Part 6, 1913, p. cvi. Hawaiian Islands.

Blepyrus mexicanus Timberlake, Proc. Haw. Ent. Soc. 3, 1918, p. 403. Mexico, Texas, Hawaiian Islands.

Blepyrus mexicanus Timberlake, Proc. Haw. Ent. Soc. 4, 1919, p. 186. Mexico, Texas, Hawaiian Islands, Manila, Philippines, Java.

Bothriencyrtus insularis Timberlake, Proc. Haw. Ent. Soc. 4, 1919, p. 213. Hawaiian Islands.

The female of *insularis* should be easily recognized from the preceding generic description and from other characters given by Cameron, Howard and Ashmead, but the male has remained undescribed up to the present time. Cameron considered his specimen to be a male, but his description applies only to the female sex. Howard's supposed male of *Blepyrus mexicanus* clearly belongs to another genus, probably a new one allied to *Anagyrus,* and Ashmead's supposed males of *Coccophoctonus dactylopii* are merely small females.

The true male of *insularis* is very similar to the female in general appearance, and without close scrutiny might be mistaken for that sex; it differs, however, rather remarkably in the structure of the antennae, as the funicle is three-jointed and the club is correspondingly enlarged.

Male. Head somewhat smaller than in the female, less menisciform and thicker fronto-occipitally; eyes smaller and considerably wider in proportion to their length; frontovertex proportionately wider or somewhat less than one-third the total width of head, and less widened behind the ocelli, the latter arranged nearly in a right-angled triangle, the posterior pair less than half their own diameter from the occipital margin; face and cheeks nearly as in the female.

Antennae inserted close to the clypeal margin; scape much shorter

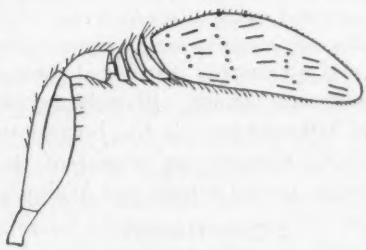

Fig. 2. *Blepyrus insularis.* Antenna of male.

and stouter than in the female, slightly widened in the middle, about one-half as long as the rest of the antennae and reaching only to the upper margin of the scrobal impression of the face; pedicel short and

stout, about a half longer than its apical thickness, but longer than the first two funicle joints combined, the false ring-joint seen in the female absent or greatly reduced; funicle with only three transverse joints, the third very short or over thrice as wide as long; club very large, solid, elongate oval in shape, its dorsal outline convex, but the ventral side straight, widest at the middle, where it is about one-third wider than the last funicle joint, and in length equal to about twice the pedicel and funicle combined.

Abdomen smaller than in the female, hardly more than one-half as long as the thorax, more acute at the apex, and usually strongly depressed above and beneath.

Other structural characters closely approximating those of the female sex, except that the frontovertex is much more opaque with finer, closer thimble-like punctures.

Coloration similar but not metallic, and with less yellow on antennae and legs, the head, thorax, and abdomen being black and only moderately shiny; antennae and legs fuscous to blackish, the apex of the front tibiae, apical half of middle tibiae, and front and middle tarsi brownish yellow, the hind tibiae slightly yellowish, the hind tarsi yellow beneath, and more or less fuscous above; wings hyaline and not distinctly stained with yellowish as in the female.

Length, (0.82 to) 1.23; length of head, 0.497; width of head, 0.544; width of frontovertex, 0.172; width of mesoscutum, 0.535; length of antenna, 0.613; length of forewing, 1.09; width of forewing, 0.487 mm.

Characters taken from a large series of females and six males reared from *Pseudococcus virgatus* (Cockerell), or associated with this host, Honolulu and vicinity, Oahu, and five females from Manila and Los Banos, Philippines (George Compere, Fullaway, and H. E. Woodworth). The males were captured on September 11 and 13, 1916, on vines of the velvet bean, heavily infested with *Pseudococcus virgatus,* and on which the females of *insularis* were very abundant.

This parasite is presumably distributed throughout the lowlands of the Hawaiian Islands, although recorded specifically only from Oahu hithertofore. It has been stated that it was taken by Blackburn, however, on several of the Islands, and I have seen females from Olowalu and Wailuku, Maui.

Life History.

Blepyrus insularis is parasitic only in *Pseudococcus virgatus* (Cockerell) so far as known. Females that were supplied with *Pseudococcus longispinus* (Targioni) oviposited rather freely, but no offspring were reared, the eggs or newly hatched

larvae presumably having been killed by the physiological reactions of the hosts. In another experiment a female was supplied with *Pseudococcus krauhniae* (Kuwana), but in this case the mealybugs were wholly ignored by the parasite.

This parasite seems always to choose first-stage larvae for oviposition, and preferably those that have recently hatched, and examines them first with her antennae. Having satisfied herself that the larva is suitable, the female turns quickly about and protrudes the ovipositor backward beneath the victim, which is punctured usually through the venter. During the process the apical part of the abdomen is extended backward and downward in a cone-shaped body. The ovipositor when protruded is slender, naked, or without external sheaths, and curved upward. The female usually places her hind tarsi on the host during oviposition, evidently partly for purposes of orientation and partly to hold it in place. The whole process of oviposition requires only about one or two seconds for completion.

Development is evidently slow, as the host itself must grow to considerable size before it is finally killed and consumed by the parasite. A female that was supplied with newly hatched *virgatus* on February 12 was observed to oviposit after a few minutes, and oviposition probably continued for several days, as on February 22 the parasite was found dead. Offspring from this reproduction began to issue on March 15 and continued to issue up to April 5, indicating a minimum length of the life-cycle of thirty-two days and a maximum of about forty-five days. The rather great range in time required is probably due to differences in the rate of the preliminary development of the host. In warmer summer weather the rate of development ought to be considerably quickened. As compared with *Pauridia peregrina* Timberlake, which has similar habits, the life-cycle is approximately the same. A female *Pauridia,* which was supplied with larvae of *Pseudococcus krauhniae* for about twenty-seven hours on January 28 and 29, oviposited freely and produced offspring which issued between February 28 and March 11, inclusive, thus indicating a minimum life-cycle of thirty-one days and a maximum of forty-three days.

Types in the Collection of the Hawaiian Entomological Society.

The custodian of the type collection of this society submits the following list of the types belonging to the society or in its care on December 31, 1921. The condition of the specimens is considered good unless otherwise stated.

DIPTERA.

Dicranomyia swezeyi Alexander..... Holotype and allotype, both badly broken
Dicranomyia stygipennis Alexander.. Five paratypes, one badly broken
Dicranomyia foliocuniculator Swezey. Holotype and ten paratypes
Tephritis swezeyi Bryan..... Holotype
Tephritis dubautiae Bryan..... Holotype and allotype

LEPIDOPTERA.

Euxoa wikstroemiae Swezey ..... Holotype and one paratype
Euxoa kerri Swezey ..... Holotype and one paratype
Phytometra violacea Swezey ..... Holotype
Omiodes giffardi Swezey ..... Holotype
Celerio perkinsi Swezey..... Holotype
Mestolobes chrysomolybdoides Swezey. Holotype and one paratype
Mestolobes quadrifasciata Swezey.... Holotype and three paratypes
Capua tetraplasandra Swezey ..... Holotype and one paratype
Capua reynoldsiana Swezey ..... Holotype and five paratypes
Semnoprepia pittospori Swezey..... Holotype and two paratypes
Semnoprepia coprosmae Swezey ..... Holotype and six paratypes
Gracilaria neraudicola Swezey ..... Holotype and five paratypes
Opostega callosa Swezey ..... Holotype and one paratype
Opostega serpentina Swezey ..... Holotype and one paratype
Opostega filiforma Swezey ..... Holotype
Opostega peleana Swezey ..... Holotype

HOMOPTERA.

Trioza ohiacola Crawford..... Holotype
Trioza hawaiiensis Crawford..... Holotype
Trioza lanaiensis Crawford ..... Holotype
Trioza pullata Crawford..... Holotype
Kuwayama nigricapita Crawford.... Holotype
Kuwayama minuta Crawford ..... Holotype
Kuwayama gracilis Crawford..... Holotype
Hevaheva hyalina Crawford ..... Holotype
Hevaheva giffardi Crawford ..... Holotype
Megatrioza palmicola Crawford..... Holotype

Cerotrioza bivittata Crawford ..... Holotype
Dictyophorodelphax praedicta
Bridwell ..... Holotype, allotype, and eight paratypes

COLEOPTERA.

Nesithmysus bridwelli Perkins ..... Holotype and one paratype
Nesithmysus forbesii Perkins ..... Holotype
Nesithmysus haasii Perkins..... Holotype
Plagithmysus platydesmae Perkins .. Holotype
Plagithmysus swezeyi Perkins..... Holotype
Clytarlus indecens Perkins..... Holotype and three paratypes
Neoclytarlus euphorbiae Bridwell.... Holotype, allotype, and four paratypes.
Xyletobius timberlakei Perkins..... Holotype and one paratype
Scricotrogus bryani Swezey..... Holotype
Stenommatus musae Marshall..... Four paratypes
Proterhinus swezeyi Perkins..... Holotype
Proterhinus impressiscutis Perkins... Holotype
Proterhinus bridwelli Perkins ..... Holotype
Proterhinus euphorbiae Perkins ..... Holotype and four paratypes
Proterhinus euops Perkins ..... Holotype and eight paratypes
Proterhinus asteliae Perkins ..... Holotype and eleven paratypes
Proterhinus abnormis Perkins..... Holotype and eight paratypes
Proterhinus phyllobius Perkins..... Holotype and seven paratypes
Proterhinus fuscicolor Perkins ..... Holotype and six paratypes

HYMENOPTERA.

Odynerus litoralis Giffard ..... Holotype and allotype
Odynerus monas var. *aeneus* Giffard. Holotype
Odynerus kauensis Giffard..... Holotype
Odynerus perkinsi Giffard ..... Holotype and allotype
Odynerus koolauensis Giffard ..... Holotype and allotype
Melanocrabro discrepans Giffard .... Holotype
Megachile timberlakei Cockerell..... Two paratypes
Itoplectis immigrans Timberlake .... Holotype, allotype, and two paratypes
Opius lantanae Bridwell..... Holotype and allotype
Microbracon pembertoni Bridwell .... Holotype and allotype
Microbracon terryi Bridwell..... Holotype and allotype
Microbracon swezeyi Bridwell..... Holotype and allotype
Hormiopterus vagrans Bridwell..... Holotype, allotype, and two paratypes
Silaon rohweri Bridwell..... Holotype and allotype
Scleroderma immigrans Bridwell .... Holotype
Sclerodermus semnoprepiae Bridwell. Holotype, allotype, and one paratype
Sclerodermus chilonellae Bridwell ... Holotype and allotype
Sclerodermus muiri Bridwell..... Holotype

Sclerodermus tantalus Bridwell ..... Holotype
Sclerodermus manoa Bridwell..... Holotype
Sierola distincta Fullaway..... Ten paratypes
Sierola armata Fullaway ..... Two paratypes
Sierola volcanica Fullaway ..... One paratype
Sierola acuta Fullaway..... Two paratypes
Sierola notabilis Fullaway..... Two paratypes
Sierola sima Fullaway ..... One paratype
Sierola spicata Fullaway ..... Three paratypes
Sierola giffardi Fullaway..... One paratype
Sierola muiri Fullaway..... One paratype
Sierola bicolor Fullaway ..... One paratype
Sierola aristoteliae Fullaway..... One paratype
Sierola levis Fullaway..... One paratype
Sierola peleana Fullaway ..... One paratype
Sierola usitata Fullaway ..... Two paratypes
Sierola koa Fullaway ..... One paratype
Sierola pilosa Fullaway ..... One paratype
Sierola megalognatha Fullaway ..... One paratype
Sierola tantalea Fullaway ..... One paratype
Sierola compacta Fullaway ..... One paratype
Sierola longicaudata Fullaway ..... One paratype
Sierola laticeps Fullaway..... Five paratypes
Sierola timberlakei Fullaway..... Two paratypes
Sierola pulchra Fullaway..... Seven paratypes
Sierola pubescens Fullaway..... Three paratypes
Sierola seminigra Fullaway..... One paratype
Sierola fuscipes Fullaway ..... Two paratypes
Sierola callida Fullaway..... One paratype
Sierola brunneipes Fullaway ..... One paratype
Sierola arida Fullaway..... One paratype
Sierola brunnea Fullaway..... One paratype
Sierola hirsuta Fullaway ..... Three paratypes
Sierola koolauensis Fullaway..... One paratype
Sierola capuana Fullaway ..... One paratype
Sierola lugens Fullaway..... One paratype
Sierola gracilariae Fullaway ..... One paratype
Sierola kaduana Fullaway ..... One paratype
Sierola cryptophlebiae Fullaway ..... One paratype
Sierola polita Fullaway ..... One paratype
Sierola opogonae Fullaway ..... One paratype
Sierola batrachedrae Fullaway ..... Two paratypes
Sierola puuwaawaa Fullaway ..... One paratype
Sierola amica Fullaway ..... One paratype
Sierola adumbrata Fullaway ..... One paratype
Sicrola nemorensis Fullaway..... One paratype
Sierola bridwelli Fullaway..... One paratype

Sierola philodoriae Fullaway..... One paratype
Sierola planiceps Fullaway ..... One paratype
Sierola hirticeps Fullaway..... One paratype
Sierola nitens Fullaway ..... One paratype
Sierola brunneiventris Fullaway..... One paratype
Sierola perottetiae Fullaway ..... One paratype
Anagyrus nigricornis Timberlake .... Holotype, allotype, and ten paratypes
Anagyrus swezeyi Timberlake..... Holotype, allotype, and fifteen paratypes
Anagyrus antoninae Timberlake..... Holotype, allotype, and ten paratypes
Xanthoencyrtus apterus Timberlake.. Holotype, allotype, and two paratypes
Xanthoencyrtus semiflavus Timberlake ..... Holotype
Xanthoencyrtus sanguineus Timberlake ..... Holotype, allotype, and six paratypes
Xanthoencyrtus laysanensis Timberlake ..... Holotype and allotype
Xanthoencyrtus bridwelli Timberlake ..... Holotype, allotype, and six paratypes
Xanthoencyrtus semiluteus Timberlake ..... Holotype, allotype, and three paratypes
Xanthoencyrtus fullawayi Timberlake ..... Holotype
Pauridia peregrina Timberlake..... Holotype, allotype and eleven paratypes
Coelopencyrtus odyneri Timberlake.. Holotype, allotype, and fourteen paratypes
Coelopencyrtus swezeyi Timberlake .. Holotype, allotype, and fourteen paratypes
Coelopencyrtus orbi Timberlake ..... Holotype, allotype, and fourteen paratypes
Quaylea aliena Timberlake..... Holotype, allotype, and two paratypes
Aphycomorpha araucariae Timberlake ..... Holotype, allotype, and six paratypes
Anicetus annulatus Timberlake..... Holotype, allotype, and two paratypes
Plagiomerus hospes Timberlake ..... Holotype and two paratypes
Anabrolepis extranea Timberlake.... Holotype
Xesmatia flavipes Timberlake..... Holotype and one paratype
Encyrtus barbatus Timberlake..... Holotype, allotype, and three paratypes

P. H. TIMBERLAKE, Custodian.

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